

Author tshingombe tshitadi

Curriculum assessment:

Career Education Didactic Report

Author: Tshingombe Tshitadi Theme: Curriculum Assessment in Trade & Engineering Education

Overview

This report examines the integration of career education materials, award certificates, diplomas, prizes, and innovative didactic systems within trade and engineering education. It emphasizes curriculum assessment, learner evaluation, and audit-ready documentation.

Scope

- Trade and engineering education at advanced levels
- Credentialing systems: certificates, diplomas, prizes
- Didactic materials: quizzes, evaluation rubrics, learner dashboards
- Innovation and invention recognition in wholesaler and technical contexts

Abstract

Career education thrives when didactic rigor, credentialing, and innovation are combined. This report explores curriculum assessment frameworks, management systems, and audit principles to ensure transparent learner recognition and sustainable educational reform.

Purpose

- To evaluate career education materials and credentialing systems
- To design audit-ready certificates and diplomas
- To integrate innovation and invention into trade wholesaler education
- To establish transparent quiz and mark evaluation systems

Keywords

Career education, didactic report, award certificate, diploma, prize, innovation, invention, trade engineering, wholesaler, quiz, evaluation, curriculum assessment, audit, management system.

Description

The report describes how career education materials can be structured into audit-ready frameworks, ensuring learners receive visible recognition through certificates, diplomas, and prizes. It highlights innovation in trade engineering and wholesaler systems.

Problematic

- Lack of standardized credentialing across trade education
- Limited recognition of innovation and invention in curricula
- Inconsistent evaluation methods and mark allocation
- Weak audit systems for compliance and transparency

Statement Report

This report asserts that career education must integrate didactic rigor, credentialing, and innovation recognition to empower learners and align with regulatory frameworks.

Management System Information

- Learner dashboards for progress tracking
- Digital credentialing systems (badges, certificates, transcripts)
- Audit-ready documentation aligned with councils and authorities

Principle Investigation

- Alignment of curriculum with regulatory standards
- Evaluation of innovation in trade wholesaler education
- Transparency in quiz and mark evaluation systems

Method Research

- Comparative analysis of credentialing frameworks
- Case studies of trade engineering education
- Surveys of learner and educator experiences
- Audit of management systems for compliance

Advantages

- Transparent credentialing and recognition
- Motivation through prizes and innovation awards
- Audit-ready documentation for compliance
- Learner empowerment via gamified dashboards

Disadvantages

- High administrative burden for audit systems
- Risk of over-standardization limiting creativity
- Resource-intensive management systems

Management System Information (Expanded)

- Integration of LMS with credentialing dashboards
- Automated quiz banks and evaluation rubrics
- Secure audit trails for certificates and diplomas

Conclusion

Career education in trade and engineering requires a balance of didactic rigor, credentialing, and innovation recognition. Audit-ready systems ensure transparency, while prizes and certificates motivate learners to achieve and invent.

Audit

- Verification of certificate and diploma authenticity
- Compliance with national and international councils
- Continuous monitoring of learner progress and evaluation systems

Bibliographic (Sample References)

- Council on Higher Education (CHE) guidelines
- Engineering Council of South Africa (ECSA) standards
- UNESCO TVET frameworks
- International Journal of Technical Education & Training

This structure gives you a **complete academic-style report** that can be adapted into curriculum assessment documentation, certificate design, or audit frameworks.

Would you like me to **expand this into a polished certificate/diploma template** (with placeholders for learner details, marks, and achievements), or into a **sample quiz bank with evaluation rubrics** to demonstrate the assessment system? Both would make this report more tangible.

Career Education Didactic Report

Author: Tshingombe Tshitadi Focus: Curriculum Assessment, Credentialing, and Innovation in Trade & Engineering Education

Introduction

- **Purpose:** To evaluate career education pathways in engineering and trade wholesaling.
- **Scope:** Didactic materials, award certificates, diplomas, and innovative credentialing systems.
- **Audience:** Educators, regulators, learners, and trade professionals.

Career Education Material

- **Curriculum frameworks:** Structured modules aligned with regulatory standards.
- **Didactic tools:** Manuals, digital dashboards, and gamified learning aids.
- **Assessment artifacts:** Exam banks, mark evaluation rubrics, and learner progress trackers.

Award Certificates & Diplomas

- **Certificates:** Audit-ready recognition of short courses and trade skills.
- **Diplomas:** Advanced qualifications in engineering and wholesaling.
- **Prizes & innovation awards:** Incentives for invention, creativity, and applied trade solutions.

Innovation & Invention in Trade Engineering

- **Applied projects:** Learners design trade solutions with engineering principles.
- **Wholesaler focus:** Advanced logistics, compliance, and technical distribution.
- **Recognition:** Badges, medals, and certificates linked to innovation outcomes.

Quiz, Marking & Evaluation

- **Quiz banks:** Modular, randomized question sets for fair assessment.
- **Mark evaluation:** Weighted rubrics ensuring transparency and compliance.
- **Feedback loops:** Learner dashboards showing achievement, gaps, and progression.

Curriculum Assessment

- **Alignment:** Mapping outcomes to national and international standards.
- **Moderation:** Ensuring fairness, inclusivity, and audit readiness.
- **Continuous improvement:** Iterative updates to reflect trade and engineering innovations.

Conclusion

Career education in trade and engineering thrives when **didactic rigor**, **credentialing systems**, and **innovation recognition** are integrated. Certificates, diplomas, and prizes not only validate

achievement but also inspire learners to invent, innovate, and contribute to global wholesaling and engineering systems.

This structure gives you a **report-style document** that can double as curriculum assessment material and a foundation for award certificate/diploma design.

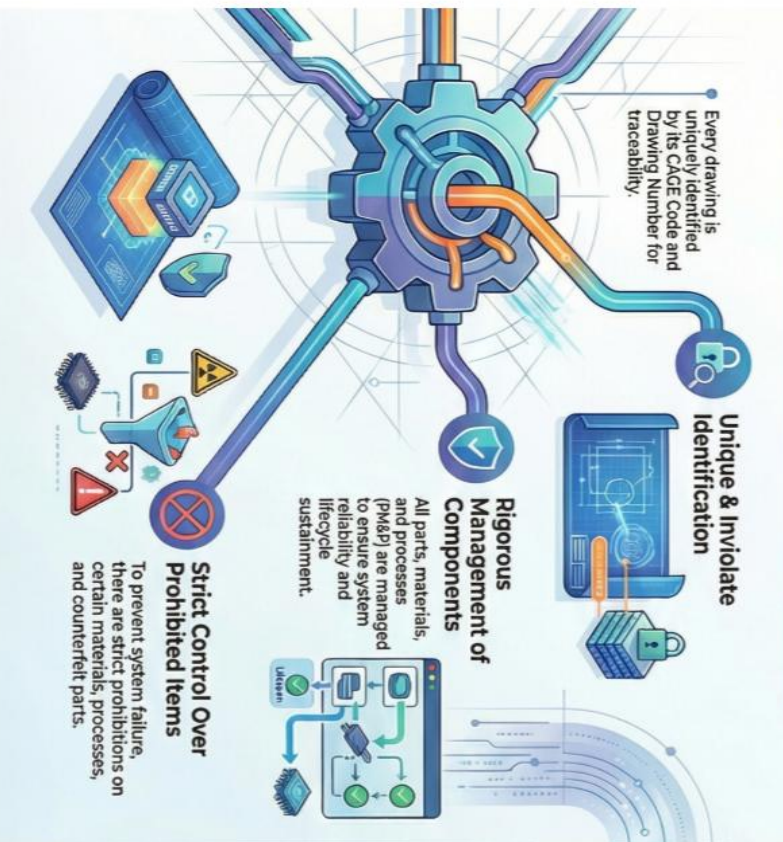
Would you like me to expand this into a **sample award certificate layout** (with placeholders for learner names, marks, and achievements), or into a **quiz bank** that demonstrates the evaluation framework? Both would make your curriculum assessment more tangible.

☞ Do you prefer me to build out sample certificate and diploma templates or quiz and evaluation examples?

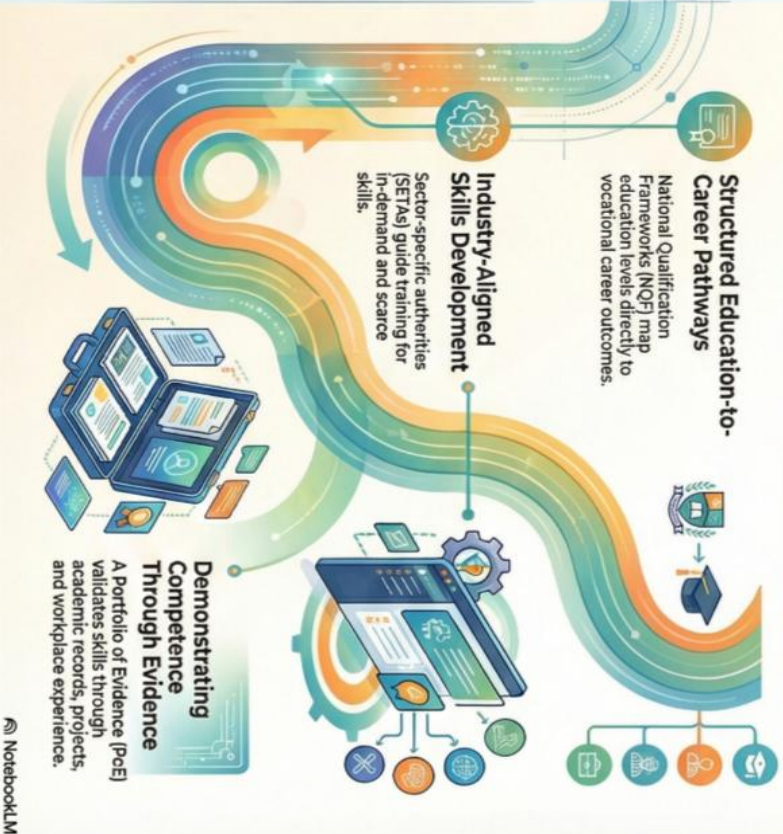
you want, I can generate a compact, printable PoE template and a WE/WA mapping sheet you can attach to each project, plus a VBA-ready credential tracker with the cost and award equations embedded for automated audit reporting.

Engineering Documentation: From Global Standards to Personal Portfolios

The Anatomy of a Formal Standard (MIL-STD)

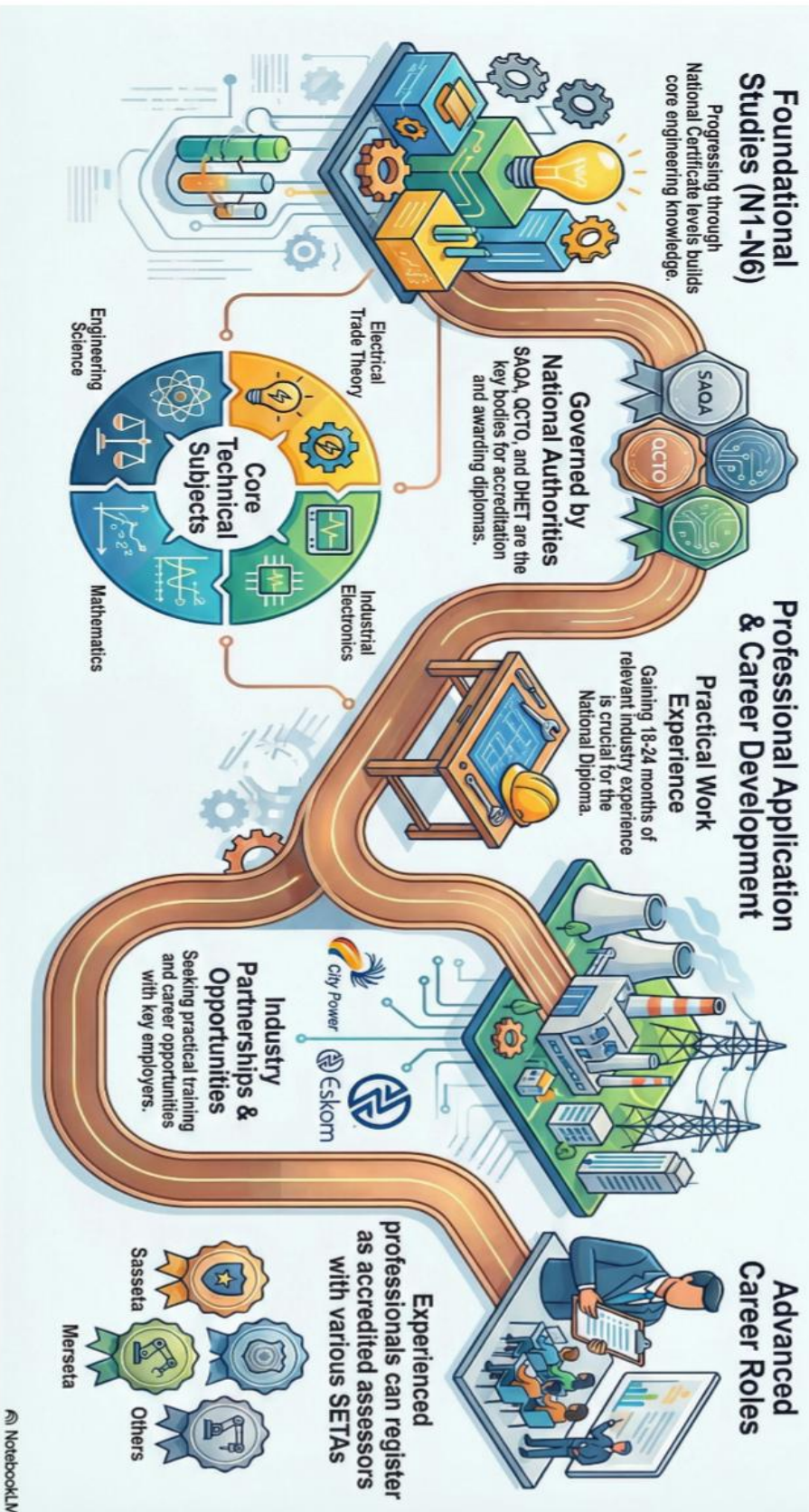


Building a Technical Career Portfolio



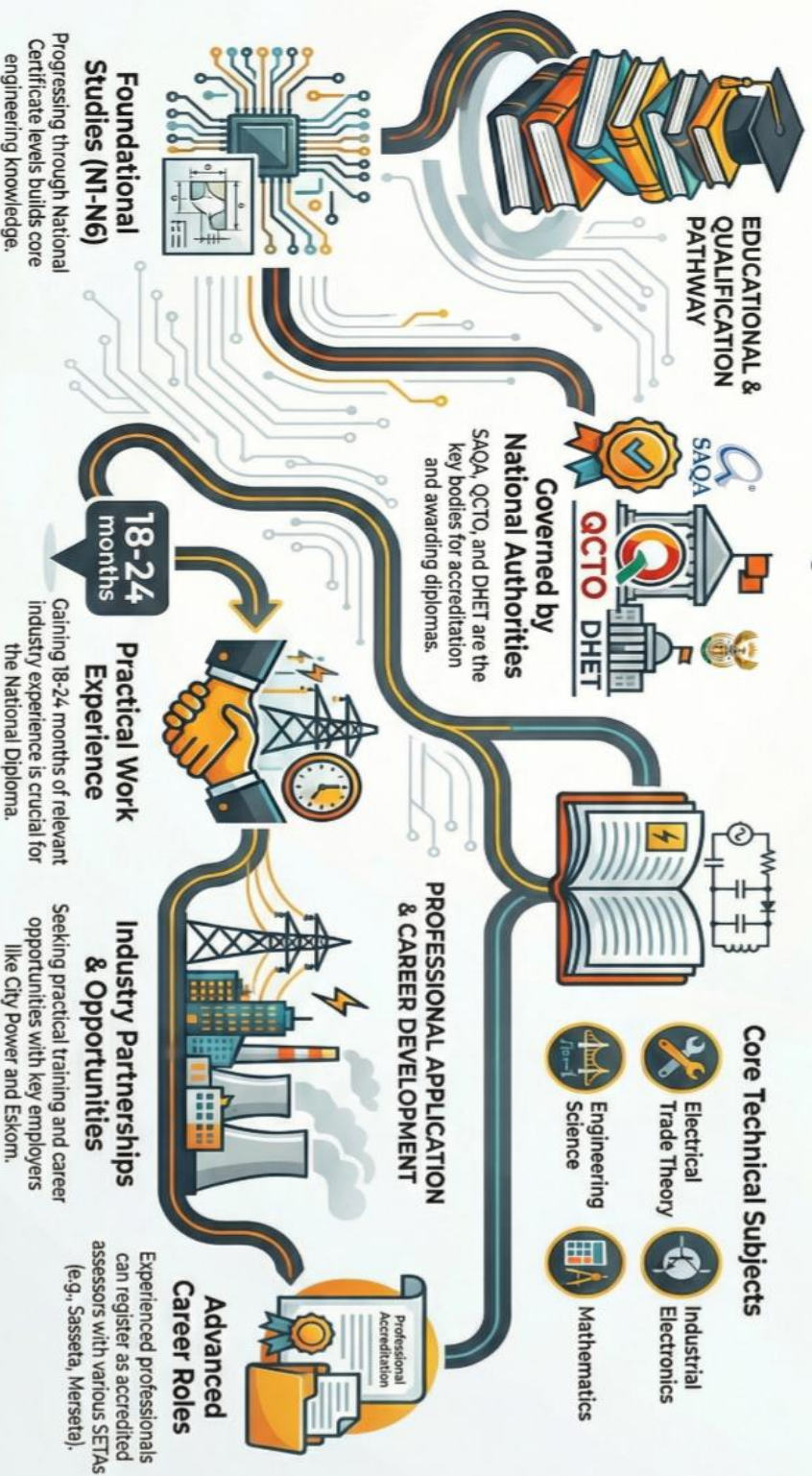
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The Electrical Engineer's Journey: From Qualification to Career

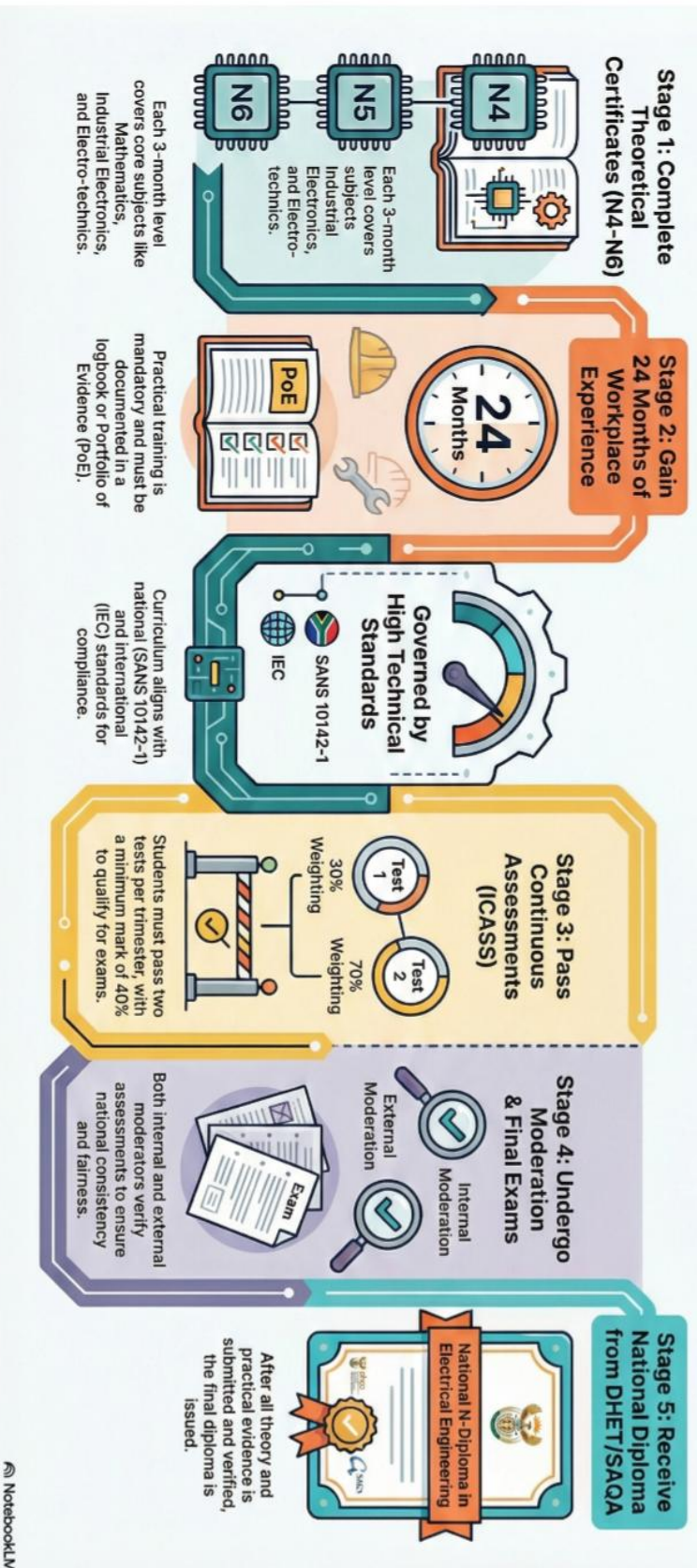


Printout

The Electrical Engineer's Journey: From Qualification to Career



Pathway to an Engineering N-Diploma in South Africa



Blueprint for a Modern Technical Career

Foundational Engineering Education



National N Diploma in Electrical Engineering (NQF Level 6)

A 360-credit qualification combining N4-N6 theory with 24 months of workplace experience.



Comprehensive Curriculum from Core Theory to Advanced Systems

Covers subjects from DC Theory and Electro-technics to Control Systems and Supervisory Management.



Mastery of Industry Standards & Compliance



Expertise in Military & Commercial Standards for High-Reliability Systems

Ensures product safety, reliability, and lifecycle management in demanding environments.



Focus on Lifecycle Management and Counterfeit Prevention

Emphasizes supplier validation, component testing, and dewatering to ensure system integrity.



Integrated Systems & Automation



Building an Audit-Ready Digital Portfolio of Evidence (PoE)

A system linking credentials, projects, and assessments into a transparent, verifiable record.



Automation for Traceability and Compliance

Uses custom tools (VBA) to create dashboards and logigrams that map career pathways.



Connecting to a Global Credentialing Ecosystem

Exports verified records to platforms like GitHub and SAQA/NQF dashboards for validation.



Category E:
Stationary Ground Systems
(Controlled environments)



Category D:
Ground & Sea Mobile Systems
(Repairable, shock, vibration)



Category C:
Aircraft Systems (Vibration, turbulence, pressure changes)



Category A & B:
Space Systems
(Continuous use, non-repairable)

The Resilient Engineer's Blueprint

A Framework for Achieving Pristine Technical Mastery
in a World of Systemic Bureaucratic Friction

APPROVED BY
DATE: OCT 26, 2023

NotebookLM

The Promise of a Structured Pathway: The National N-Diploma Framework

The National N-Diploma in Electrical Engineering is designed as a progressive, year-long program built on a logical sequence of theoretical knowledge. This structure promises a clear path from foundational principles to advanced application.

N4 Certificate

- Mathematics
- Engineering Science
- Industrial Electronics
- Electro-technics
- Digital Electronics

N5 Certificate

- Mathematics
- Power Machines
- Industrial Electronics
- Electro-technics
- Supervisory Management

N6 Certificate

- Mathematics
- Power Machines
- Industrial Electronics
- Electro-technics
- Supervisory Management
- Control Systems
- Installation Rules
- Specialised Electric Codes

Key Takeaway: The curriculum requires a 40% minimum pass per subject and culminates in a diploma after 2 years of documented practical experience, creating a well-defined standard for competency.

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-001

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“The Reality of Systemic Friction: Navigating the Administrative Maze”

Despite a well-defined curriculum, the path to qualification is often obstructed by systemic administrative failures. These challenges move the engineer's focus from technical problems to bureaucratic battles.

Learner Name	Submission Timestamp	Status
John Doe	2023-01-16 13:31	Pending
Jane Smith	2023-03-21 15:45	Pending
Robert Chen	2023-05-10 09:12	Pending
Emily Davis	2024-02-12 11:36	Submitted

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-002

The Two Worlds: Where Engineering Precision Meets Bureaucratic Inefficiency

The World of Standards

Table IV. Hermetic Microcircuit and Semiconductor Requirements

Equipment Category	Microcircuit	Semiconductor
A	MIL-PRF-38535 (Class S), MIL-PRF-38534 (Class K)	MIL-PRF-19500 (JANS)
B	MIL-PRF-38535 (Class S, B), MIL-PRF-38534 (Class K, H)	MIL-PRF-19500 (JANS, JANTXV, JANTX)
C	MIL-PRF-38535 (Class S, B), MIL-PRF-38534 (Class K, H)	MIL-PRF-19500 (JANS, JANTXV, JANTX)
D	AEC Q100, MIL-PRF-38535 (Class S, B), AEC Q100, MIL-PRF-38535 and MIL-PRF-38535	AEC Q101 or MIL-PRF-19500 or MIL-PRF-19500
E	AEC Q100, MIL-PRF-38535 (Class S, B), AEC Q100, or MIL-PRF-38535	AEC Q101 or MIL-PRF-19500 or MIL-PRF-19500
T	AEC Q100, MIL-PRF-38535 (Class S, B), AEC Q100, MIL-PRF-38535 and MIL-PRF-38535	AEC Q101 or MIL-PRF-19500 or MIL-PRF-19500

The World of Process

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-003

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Forging the Toolkit: Mastering the Uncompromising Language of Reliability

To navigate a system where credentials can be questioned, one must build a foundation on indisputable, globally recognized standards. Military (MIL-STD), international (IEC), and industry (IPC) specifications become the vocabulary of verifiable excellence.



These standards provide a framework for consistency, interoperability, and audit-ready documentation, forming the bedrock of a resilient engineering practice.

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-004

NotebookLM

Deconstructing Reliability: Inside MIL-STD-11991B Parts, Materials, and Processes (PM&P)

This standard establishes rigorous requirements for every component in a military system, focusing on counterfeit prevention, lifecycle management, and documented quality.

Key Definitions

Term	Definition
Approved Supplier	Formally assessed supplier with adequate procedures for providing parts/materials, including counterfeit avoidance...
Authorized Supplier	Supplier authorized by the original component manufacturer (OCM) to buy parts directly.
Broker	Unauthorized supplier, typically independent distributor, buying/selling parts without stock or OCM authorization.
COTS item	Commercially Available Off-the-Shelf item: sold in substantial quantities in marketplace and avoids to authorize inerse physical equipmment...
Counterfeit Part	Unlawful/unauthorized reproduction, substitution, or alteration misrepresented as authentic.
Derating	Using components below maximum ratings to improve reliability.

Incoming Inspection Data Requirements (Appendix H)

Requirement	Applies to: EEE parts	Applies to: Mechanical parts	Applies to: Materials
Database fields maintained for life	✓	✓	✓
Documented procedures for tests	✓	✓	✓
Radiological inspection (X-ray)	Yes (as applicable)	✓	—
DPA (Destructive Physical Analysis)	Categories A-B required	—	—
XRF (material discrepancies)	✓	—	—
PIND (Particle Impact Noise Detection)	Categories A-C, T	—	—

Excerpt from Appendix H

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-005

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Proving Robustness: Environmental and Mechanical Stress Testing in Practice

Compliance is not theoretical. MIL-STD-202G and MIL-STD-810 mandate a battery of tests that subject components to the harsh realities of their operational environment, from thermal shock to random vibration.

Thermal Shock (Method 107G)

Table 107I. Thermal Shock (Air)

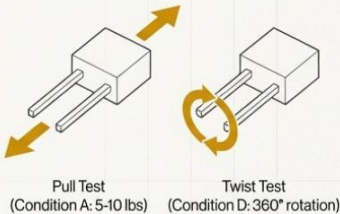
Step	Temp Profile (°C)	Cycles
A	-55 → +25 → +85 → +25	5, 25, 50, 100
B	-65 → +25 → +125 → +25	5, 25, 50, 100
F	-65 → +25 → +150 → +25	5, 25, 50, 100

Random Vibration (Method 214A)

Table 214I. Test Condition I

Test Condition Letter	Power Spectral Density (g ² /Hz)	Overall RMS G
A	0.02	5.35
B	0.04	7.56
C	0.06	9.26
D	0.10	11.95

Terminal Strength (Method 211A)



PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-006
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Building Fluency Across Ecosystems: Integrating Military, Safety, and Commercial Standards

Mastery requires navigating the intersection of military documentation standards (MIL-STD-100G) and international hazard-based safety standards (IEC 62368-1). Understanding both is critical for designing ruggedized, safety-critical systems.

MIL-STD-100G vs. IEC 62368-1:2024

Dimension	MIL-STD-100G	IEC 62368-1:2024
Safety Focus	Critical Safety Items (CSI) & Characteristics	Hazard-Based Safety Engineering (HBSE)
Drawing Practices	Prescriptive drawing formats (ASME Y14.100M)	Performance-based; documentation must support risk assessment
Change Control	Formal revision blocks and engineering evaluation for changes to CSIs	Changes affecting safeguards require an updated risk assessment
Qualification	Source control qualification by design activity	Certification by accredited labs (e.g., CB Scheme, NRTL)

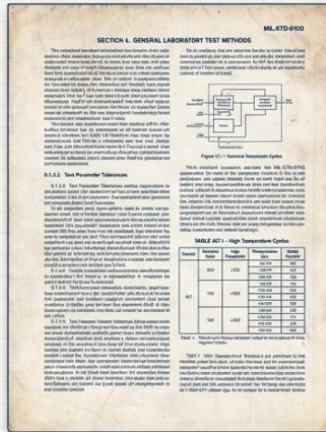
Key Intersection Point:
Risk-Based vs. Prescriptive

Key Intersection Point:
Risk-Based vs. Prescriptive

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-007
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Forging Tools of Order: Automating Compliance and Audit Readiness

Faced with hundreds of pages of dense standards, the resilient engineer builds tools to automate the process. Custom Visual Basic (VBA) scripts transform static documents into dynamic, audit-ready checklists, logigrams, and competency matrices.



Parse & Systematize

```

Sub BuildMilStd810AuditChecklist()
    Dim ws As Worksheet
    Dim milStdDoc As String
    Dim auditTable As ListObject

    ' Define patterns to search in the MIL-STD document
    sectionPatterns = Array("Applicability to \"ruggedized\" ...",
        "Related documents", ...)
    .Range("A1").Value = "Section"
    .Range("A1").Value = "Section"

    ' Create new worksheet for the checklist
    Set ws = ThisWorkbook.Worksheets.Add
    ws.Name = "Audit_Checklist"

    ' Set up table headers
    .Range("B1").Value = "Requirement"
    .Range("C1").Value = "Compliance Status"
    .Range("D1").Value = "Evidence / Notes"
    
```

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-008

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The Indisputable Artifact: Compiling the Portfolio of Evidence (PoE)

In an environment where systemic processes can fail, the PoE becomes the ultimate proof of competence. It is a meticulously curated collection of verifiable records—from assessment results to workplace logbooks—that demonstrates mastery beyond any single certificate.

Project Artifacts & Technical Drawings

Aligning with MIL-STD-100G



Moderator Reports

Internal and External verification



Internal Continuous Assessment (ICASS) Records

Referencing Report 191 policies and test weightings



DHET Transcript & Submission Records

Showing SAQA IDs and learner identifiers



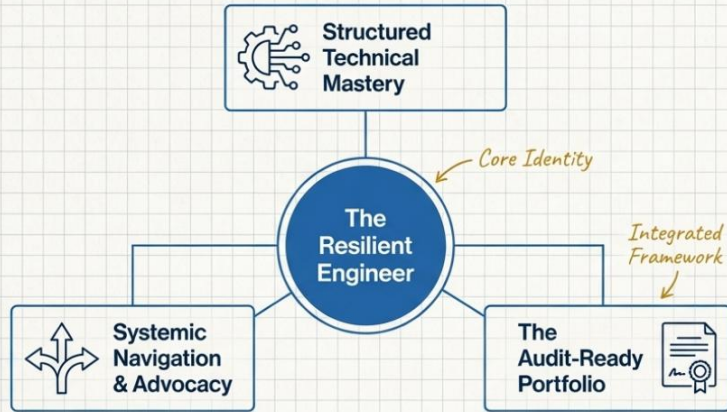
Workplace Logbooks

Documenting 24 months / 2,670 hours of experience

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-009

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The Synthesis: A Blueprint for Professional Resilience and Verifiable Mastery



This framework integrates three critical domains. It moves beyond mere technical skill to build a resilient professional capable of thriving in complex environments by mastering the curriculum, navigating the system, and proving their competence with undeniable evidence.

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-010

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Pillar 1: Integrating World-Class Standards into the Core Curriculum

True mastery connects academic knowledge to the highest industry and military standards. Each subject in the N4-N6 curriculum becomes a platform for applying principles of reliability, safety, and environmental robustness.

N-Diploma Subject (N4-N6)	Linked Standard/Concept
Industrial Electronics (N4-N6)	→ Component Derating Factors (MIL-STD-11991B, Appendix A) PIND Testing (MIL-STD-202G, Method 217A)
Power Machines (N5-N6)	→ EMC/EMI Considerations (MIL-STD-461) Fungi Susceptibility of Materials (MIL-STD-11991B, Table XXXI)
Control Systems (N6)	→ Contact Chatter Monitoring (MIL-STD-202G, Method 310)
Installation Rules (N6)	→ SANS 10142-1 Compliance Wiring & Terminal Strength (MIL-STD-202G, Method 211A)

Direct application of principles

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-011

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Pillar 2: The Systemic Navigation Toolkit

Resilience requires a specific skillset for engaging with administrative and legal systems. This involves leveraging official processes, maintaining meticulous records, and understanding the language of regulatory bodies.



Formalizing Disputes

Utilize official channels like the CCMA for dispute resolution to create a formal, documented record of engagement.



Managing Record Integrity

Track all submissions to bodies like DHET and SAQA, documenting dates, names, and statuses to counter delays and build a case for escalation.



Leveraging Regulatory Bodies

File formal complaints with oversight authorities like PSIRA to ensure accountability and trigger official investigation processes.



Engaging Law Enforcement

Use official SAPS processes for documentation, such as point-out notes and case numbers, to create an undeniable record when necessary.

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-012

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Pillar 3: Generating Audit-Ready Proof of Competence

The framework culminates in the production of standardized, evidence-backed documents that map skills to formal requirements. These artifacts are designed for clarity, verifiability, and immediate use in assessment and moderation.

Audit-Ready Checklist Template

Asset ID	Standard Applied	Test Method	Result	Signatures	Evidence Links
PWB-001	IPC-6010 Class 3	Sectioning Analysis	Pass	[Digital Signature]	[Link to Report]

Direct access to raw test data & reports

Competency Matrix (NATED/NCV Mapping)

	Knowledge	Application	Troubleshooting
Diodes & Rectifiers	✓	✓	✓
AC Drives	✓	✓	✓
UPS Systems	✓	✓	
Power System Protection	✓	✓	✓

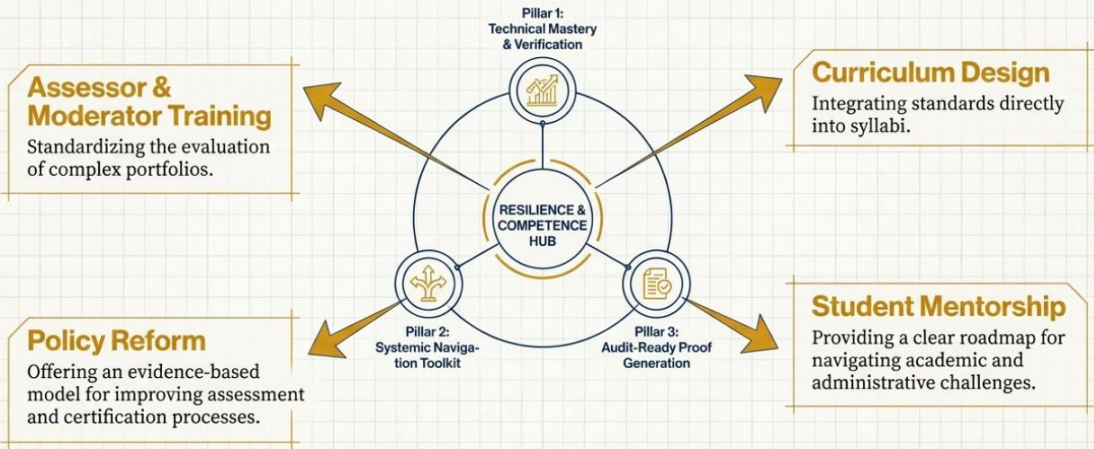
Demonstrates practical problem-solving ability

PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO: ELEC-ENG-013

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From Personal Journey to a Replicable Blueprint for the Next Generation

This framework is more than a personal survival guide; it is a scalable blueprint for reforming technical education. It provides a model for mentors, a guide for students, and a case study for policymakers on how to build resilience and verifiable competence into the heart of our engineering pathways.



PROJECT: N-DIPLOMA FRAMEWORK // DRAWING NO. F1.FC-ENG-014

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Mastery vs. The Maze: The Two Fronts of a Modern Technical Career

THE FRONTLINE OF TECHNICAL MASTERY

Adherence to Strict Standards is Non-Negotiable

Compliance with military and industrial standards (e.g., MIL-STD, SANS) is critical for reliability.

Fluency in Modern Tools is a Requirement

Professionals must use modern tools like PLCs, SCADA, Visual Basic, Azure, and AI.

Mastery of Advanced Theory is Essential

Modern vocational engineering requires a deep understanding of calculus, physics, and circuit theory.

THE BATTLEGROUND OF BUREAUCRACY

Systemic Failures Create Major Obstacles

Professionals face decades-long certification backlogs, administrative delays, and exam irregularities.

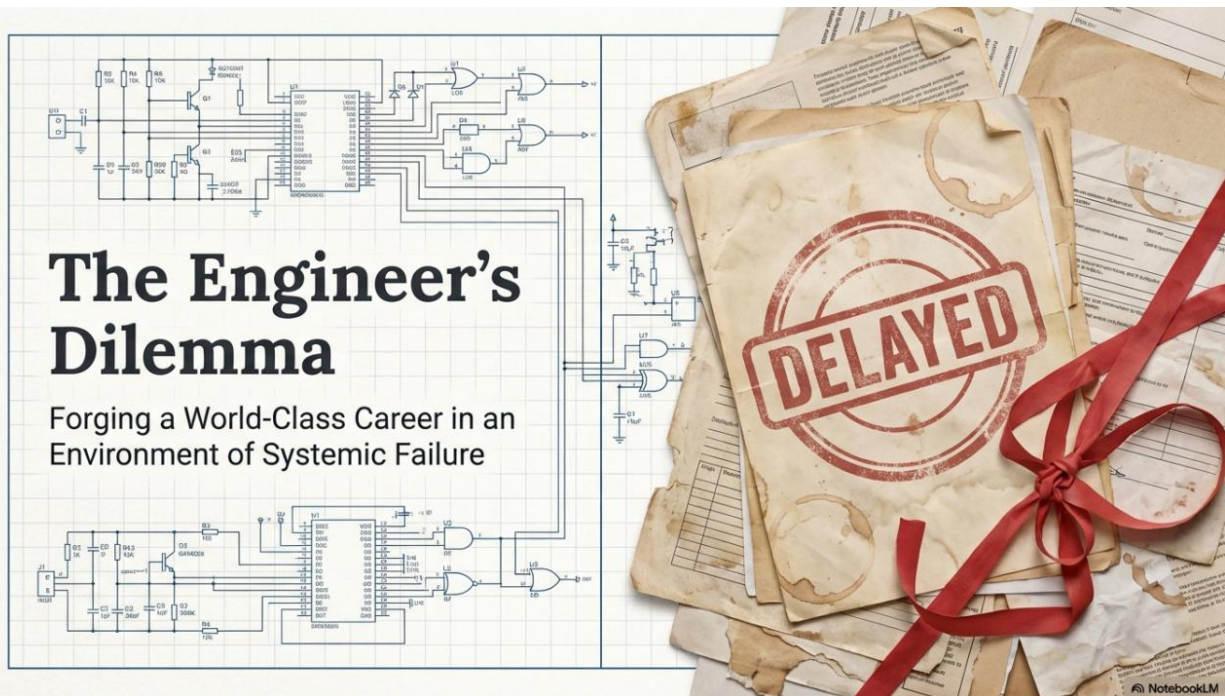
Navigating a Maze of Regulatory Bodies is a Constant Fight

Success requires managing complex frameworks from SQA, DHET, OCTO, and multiple SETAs.

A "Portfolio of Evidence" is the Ultimate Defense

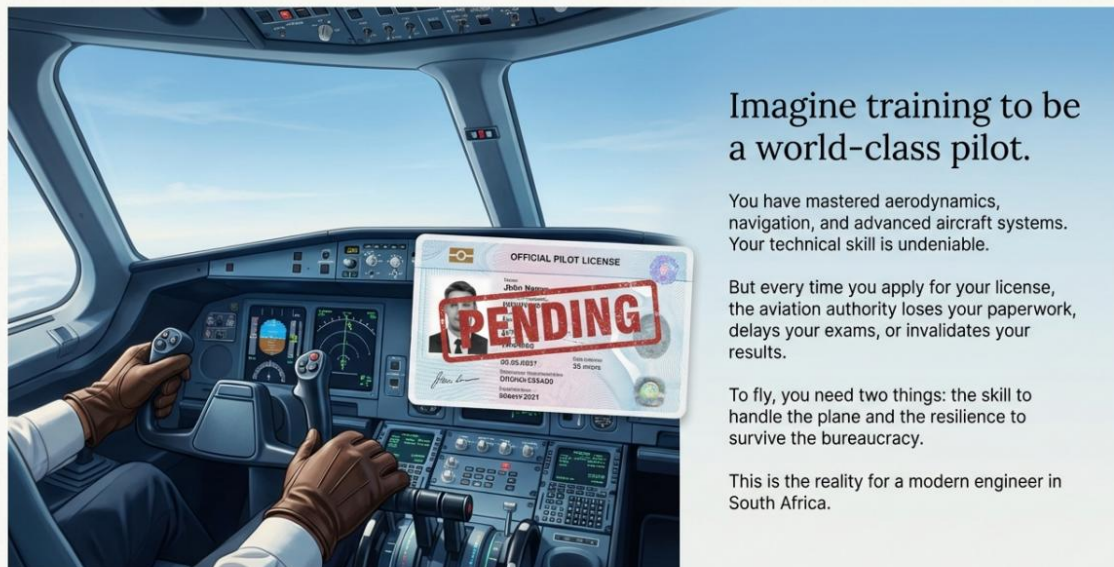
A career is proven not by a resume, but by a collection of documented proof.

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The Engineer's Dilemma

Forging a World-Class Career in an Environment of Systemic Failure



Imagine training to be a world-class pilot.

You have mastered aerodynamics, navigation, and advanced aircraft systems. Your technical skill is undeniable.

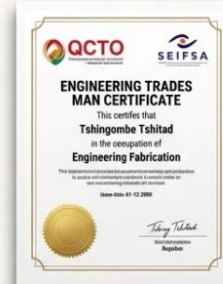
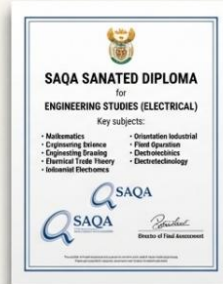
But every time you apply for your license, the aviation authority loses your paperwork, delays your exams, or invalidates your results.

To fly, you need two things: the skill to handle the plane and the resilience to survive the bureaucracy.

This is the reality for a modern engineer in South Africa.

The First World: A Universe of Technical Precision

Success demands mastery over a vast and complex technical landscape, governed by physics, advanced mathematics, and uncompromising international standards.



Advanced Mathematics: Calculus, Laplace transforms, and differential equations for system analysis ($E = \int P(t)dt$, $V = Ldi/dt$).



Digital Control: Logic gates, Boolean algebra, and PLC/SCADA systems for industrial automation.



Power Systems: Design and analysis of AC/DC machines, transformers, and three-phase distribution.



International Standards: Adherence to strict military (MIL-STD) and industrial (IPC) standards for mission-critical reliability.

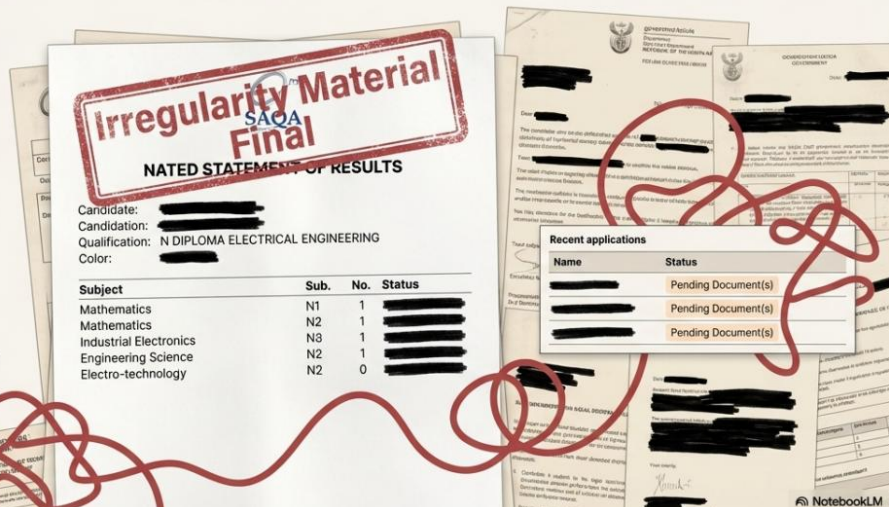
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The Second World: A Maze of Administrative Struggle

Parallel to the world of technical logic is a dysfunctional qualification system plagued by decades of **systemic failure**, creating immense obstacles for even the most qualified professionals.

Systemic Failures

- **Certification Backlogs**:** Official records document delays in issuing diplomas dating back to 1992.
- **Examination Irregularities**:** Widespread issues leading to invalidated results and paused qualifications.
- **Fragmented Frameworks**:** A complex and often misaligned system of regulatory bodies (SAQA, DHET, QCTO, SETAs).



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The Core Conflict: Technical Mastery vs. Bureaucratic Resilience

“The Real Final Boss is Bureaucracy.”

Technical Mastery



Administrative Struggle



The defining challenge is not a lack of skill, but the need to possess elite-level technical expertise while simultaneously navigating a broken administrative system. This dual competency is the unspoken requirement for success.

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The Response: Building a Career as a Portfolio of Evidence

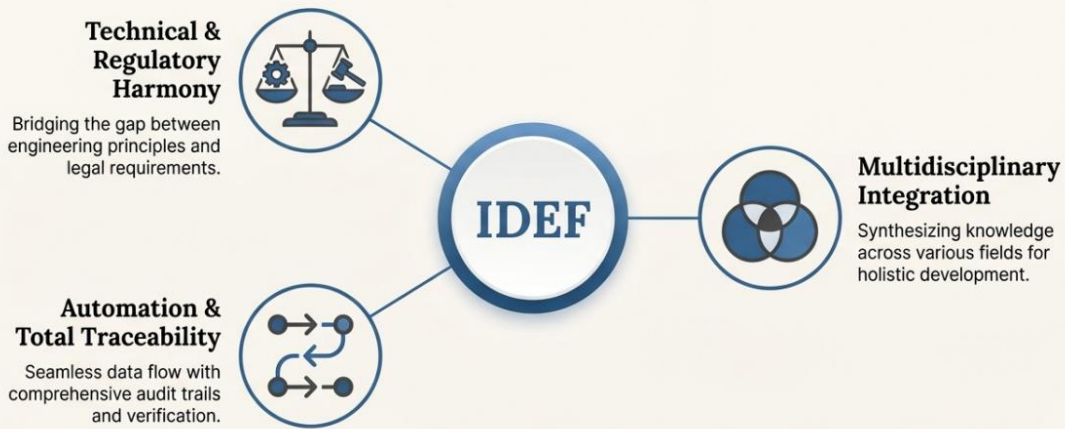
The solution was not born from theory, but forged through a documented journey of continuous learning and system navigation. This career is not a static resume; it is an auditable, credential-linked portfolio proving mastery across multiple domains.



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The Solution: An Integrated Framework for Education and Credentialing

The IDEF is a modular, credential-linked system designed to harmonize technical training, regulatory compliance, and career development. It creates a transparent, auditable, and resilient ecosystem for learners and institutions.



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Pillar 1: Harmonizing Technical Curriculum with Regulatory Standards

The framework aligns every module, from foundational theory to advanced practice, with both national (SAQA/NQF) and international (SQA/SCQF) standards. This ensures that qualifications are verifiable, portable, and industry-relevant.

Key Alignments

- Foundational**: NATED N1-N6 subjects (Electrical Trade Theory, Industrial Electronics, Mathematics) form the core.
- Vocational**: Competencies map directly to QCTO trade qualifications and MERSETA requirements.
- International Benchmarking**: Curricula are compared against frameworks like the Scottish SQA Advanced Diploma in Electrical Engineering (SCQF Level 8).



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Pillar 2: Achieving Total Traceability through Automation

The system's backbone is an automation engine built with **Visual Basic (VBA)**. It transforms manual, error-prone administrative tasks into a transparent, real-time, and audit-ready digital process.

System Features



Logigrams & Algorigrams: Automate workflows for assessment, compliance, and even disciplinary procedures.



Credential-Linked Dashboards: Provide live tracking of learner progress, awards, and costs.



Audit-Ready Exports: Generate bilingual (English/French), traceable records for regulatory bodies like SAQA and Umalusi.

```
Sub GenerateReport()  
    Dim wb As Workbook  
    Set wb = ThisWorkbook  
    Dim ws As Worksheet  
    Set ws = wb.Sheets("Report")  
    Dim chartObj As Chart  
    For Each chartObj In ws.ChartObjects  
        chartObj.Chart.Export ws.Path & ".png",  
        ws.Path & ".png",  
        ws.ExportAsDataRange, True  
    Next chartObj  
    Dim pdfPath As String  
    pdfPath = ws.Path & ".pdf"  
    ws.ExportAsDataRange pdfPath, True  
    MsgBox "Audit report generated successfully"  
End Sub  
  
Function GetLearnerProgress(learnerID As String) As String  
    'Code to calculate progress  
End Function  
  
Sub UpdateDashboardData()  
    'Refresh data from database  
End Sub
```



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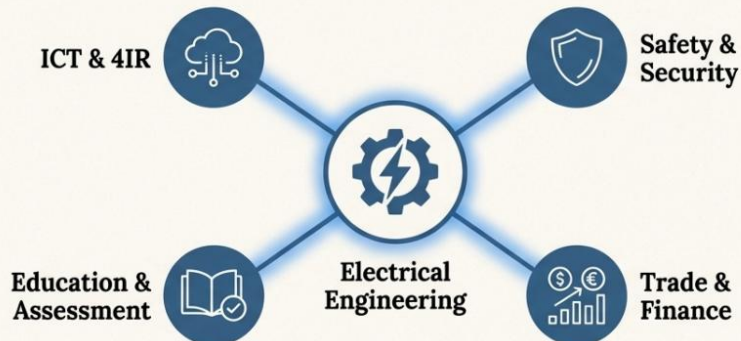
Pillar 3: Integrating Multiple Disciplines for Holistic Problem-Solving

“Specialization is for insects.”

Modern challenges are rarely confined to a single domain. The framework integrates core engineering with ICT, data science, public safety, and financial management to produce versatile professionals who can connect dots and see the whole system.

Integrated Domains

- ICT & 4IR
- Safety & Security
- Education & Assessment
- Trade & Finance



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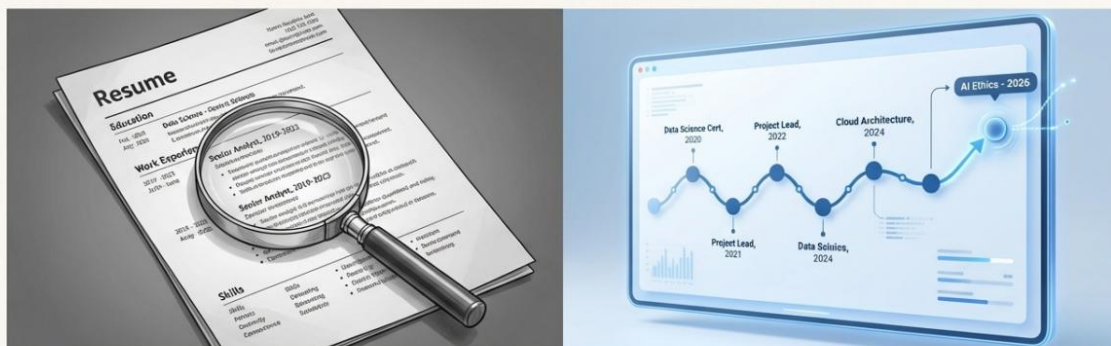
The Output: An Audit-Ready Credential Record Book

The framework culminates in a comprehensive, traceable record of a learner's entire professional journey. This Portfolio of Evidence (PoE) links every qualification, project, and cost into a single, verifiable ledger, providing irrefutable proof of competence for employers, institutions, and regulatory bodies.

Date	Institution	Item / Credential	Cost	Amendments	Final Balance	Integration Points
2023-12-31	Schneider Electric	EcoStruxure Expert Cert.	R0.00	N/A	R0.00	Mapped to NQF 5; Linked to PoE
2022-12-01	Microsoft	Azure AI Fundamentals	R1,500.00	(R500 Grant)	R1,000.00	Linked to GitHub Repo; 4IR Skills
2025-07-21	SQA	SCQF Level 6 Award	R3,000.00	N/A	R3,000.00	International Benchmark; Articulation Pathway
2024-01-01	DHET	National N Diploma (N6)	R12,000.00	N/A	R12,000.00	SAQA ID 111285; Linked to Logbook
2025-12-01	IJETR	Research Publication	R500.00	N/A	R500.00	ORCID Linked; Professional Contribution

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The Vision: A Career is a Living Document



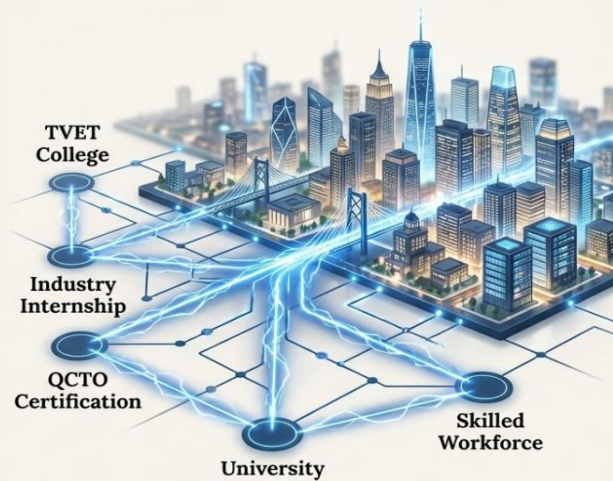
A resume is a static summary of the past. A portfolio of evidence is a living document, constantly evolving with every new skill, project, and certification.

This framework transforms a career narrative from a list of claims into a dynamic, verifiable, and ever-expanding body of proof. It is designed for continuous growth, not just periodic review.

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The Bigger Picture: Education as Critical Infrastructure

Just as a nation relies on its electrical grid for power, it relies on its educational system for skilled human capital. When this system is inefficient or broken, the entire economy suffers. The IDEF treats education not as a service, as a piece of mission-critical infrastructure to be engineered, managed, and optimized for reliability, transparency, and performance. It is a blueprint for building a more resilient and competitive workforce.



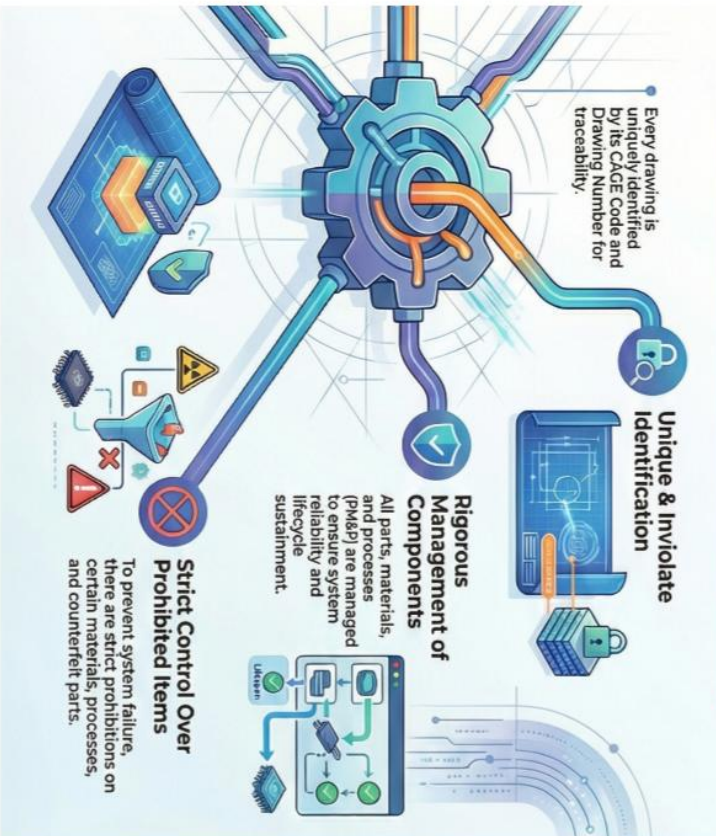
Now, they have the system.

A world-class engineer, like a world-class pilot, deserves a system that recognizes their skill, not one that obstructs it.

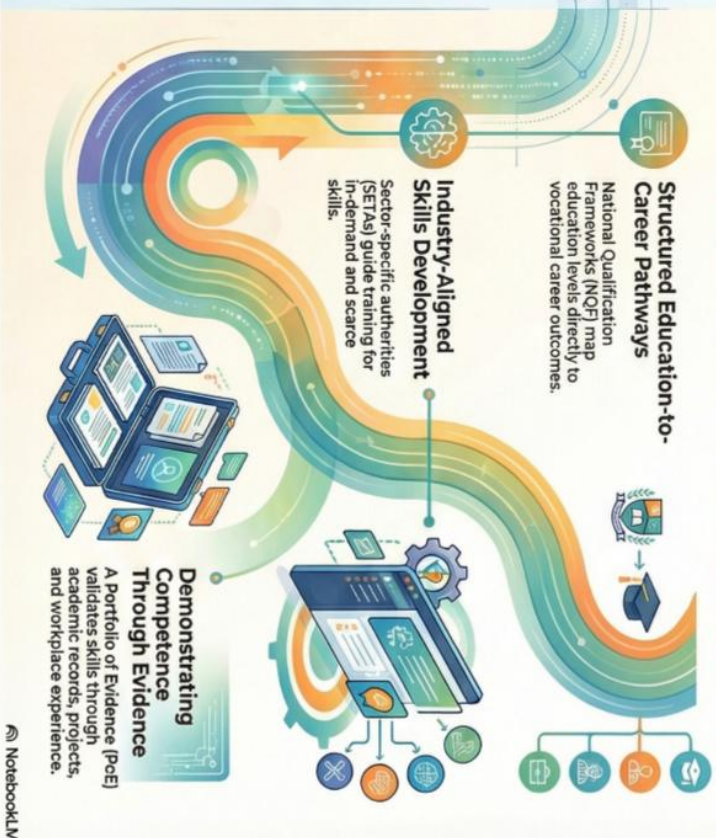
An integrated, transparent, and auditable framework doesn't just issue certificates—it clears the runway for takeoff.

Engineering Documentation: From Global Standards to Personal Portfolios

The Anatomy of a Formal Standard (MIL-STD)



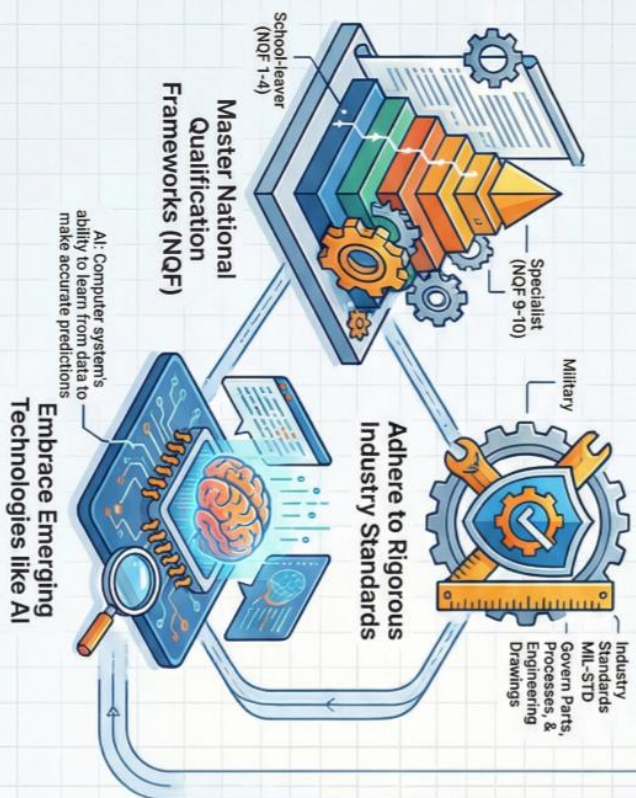
Building a Technical Career Portfolio



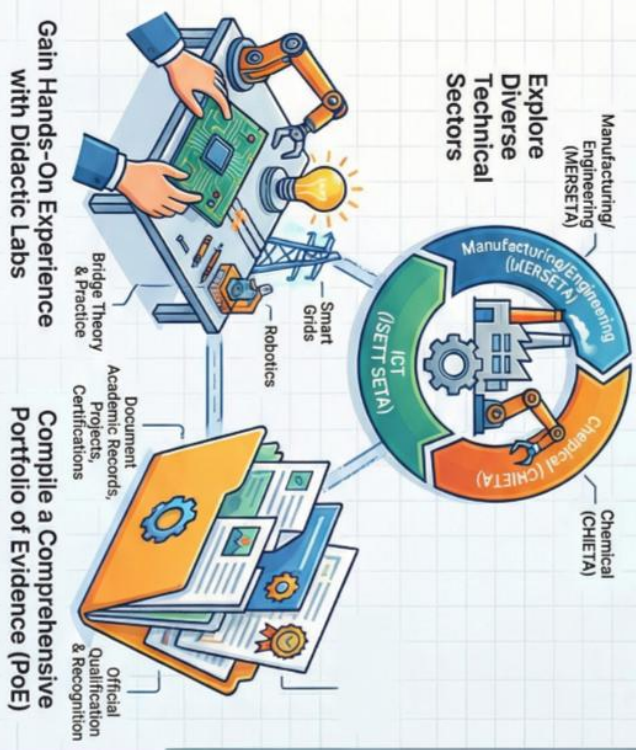
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The Engineer's Blueprint: Building a Career from Theory to Trade

FOUNDATIONAL KNOWLEDGE & STANDARDS



APPLIED SKILLS & CAREER PATHWAYS



Bridging the Gap: Reforming South Africa's Vocational Engineering Education

THE CHALLENGE: SYSTEMIC HURDLES IN TVET ENGINEERING

THE PATH FORWARD: A BLUEPRINT FOR REFORM

Inconsistent Qualification Frameworks

Challenges exist in combining NATED & NCV qualifications, creating backlogs and policy irregularities.

Disconnect Between Training and Industry

National frameworks often don't match local industry needs, limiting practical workplace learning.

Widespread Assessment & Integrity Issues

Students face examination irregularities, delayed results, and issues with non-accredited institutions.

Modernize with Education Technology

Implement Learning Management Systems (LMS) to enhance curriculum delivery, track progress, and support students.

Integrate NATED & NCV Systems

Combine national diploma and certificate frameworks for a more effective and streamlined vocational system.

Strengthen Work-Integrated Learning

Align classroom learning with industry placements and hands-on experience at companies like Eskom and City Power.

The Engineer's Odyssey

Charting the Path to Technical Mastery in South Africa

NotebookLM

The Quest for Qualification

The journey to becoming an electrical engineer in South Africa is a demanding odyssey. It challenges a candidate to transform theoretical knowledge into practical, certified expertise.

The Protagonist

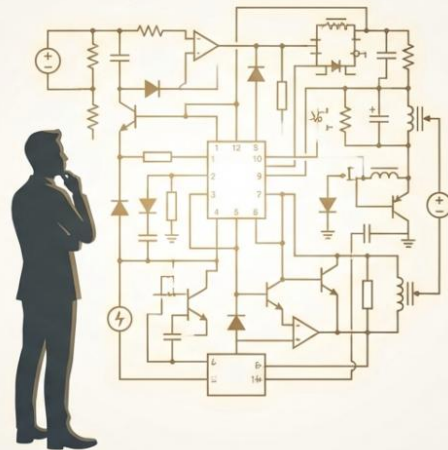
An aspiring technician, our "Candidate," embarks on this path.

The Goal

To earn the National N Diploma in Electrical Engineering, a qualification registered by the South African Qualifications Authority (SAQA) that signifies readiness to power the nation's industry.

The Path

A structured progression through National Accredited Technical Education Diploma (NATED) courses, from N1 to N6, combining rigorous classroom theory with essential workplace experience.



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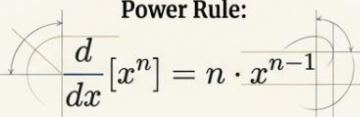
Forging the Foundation: The Language of Engineering

Before building circuits, the Candidate must master the language of change and accumulation: Calculus. These mathematical principles are the essential tools for analyzing dynamic systems.

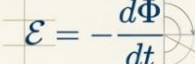
Differential Calculus (The Science of Change)

Used to analyze rates of change, crucial for understanding velocity, acceleration, and current.

Power Rule:


$$\frac{d}{dx} [x^n] = n \cdot x^{n-1}$$

Faraday's Law of Induction:

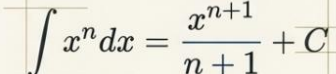

$$\mathcal{E} = -\frac{d\Phi}{dt}$$

(Relates changing magnetic flux to induced voltage)

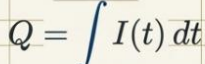
Integral Calculus (The Science of Accumulation)

Used to calculate total values over time, like energy, charge, or area.

Power Rule for Integration:


$$\int x^n dx = \frac{x^{n+1}}{n+1} + C$$

Electric Charge Calculation:


$$Q = \int I(t) dt$$

(Calculates total charge from a varying current)

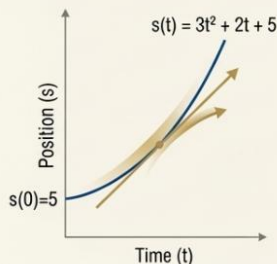
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From Abstract Equations to Engineering Principles

The Candidate's first challenge is to apply these mathematical tools to describe and predict the behavior of physical systems.

Application Area 1: Motion Analysis

Calculus is used to derive velocity and acceleration from an object's position over time.



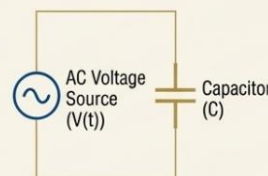
Example: If position is $s(t) = 3t^2 + 2t + 5$, then:

Velocity is the first derivative:
 $v(t) = s'(t) = 6t + 2$

Acceleration is the second derivative:
 $a(t) = s''(t) = 6$

Application Area 2: Alternating Current (AC) Circuit Theory

Derivatives and integrals are essential for analyzing the behavior of capacitors and inductors in AC circuits.



Example: The current flowing through a capacitor is proportional to the rate of change of voltage across it.

Capacitor Current:

$$I(t) = C \frac{dV(t)}{dt}$$

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Ascending the Levels: The NATED N1-N3 Gauntlet

The Candidate's journey progresses through the initial NATED levels, where foundational theory meets practical application. These modules build a working knowledge of the components that power daily life.



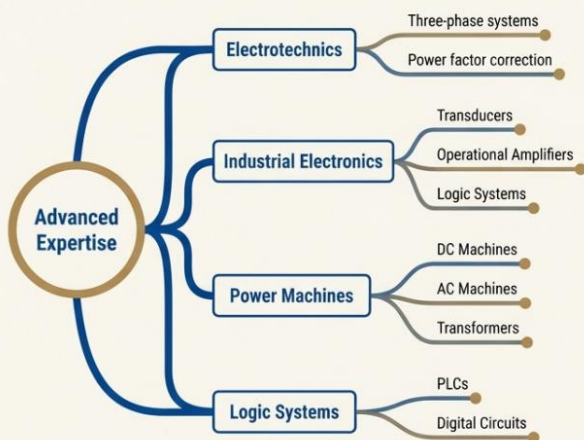
Core N1-N3 Modules Include:

- **Electrical Trade Theory:** Understanding the fundamental laws (Ohm's, Kirchhoff's) and principles of electricity.
- **Industrial Electronics:** Introduction to basic components like diodes and transistors.
- **Engineering Science & Drawing:** Applying physics and learning the visual language of technical blueprints.
- **Mathematics:** Reinforcing the core mathematical skills required for all technical calculations.



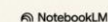
The Crucible of Advanced Theory: N4-N6

In the senior NATED levels, the Candidate confronts the most complex challenges. The focus shifts from basic components to the analysis and design of high-power industrial systems, logic control, and electromechanical machinery.



Key N4-N6 Subjects:

- * **Electrotechnics:** Advanced circuit analysis, including three-phase systems and power factor correction.
- * **Industrial Electronics:** Deeper dives into transducers, operational amplifiers, oscillators, and logic systems (Boolean Algebra, logic gates).
- * **Power Machines:** Detailed study of DC and AC machines (motors, generators) and transformers.
- * **Logic Systems:** Design and troubleshooting of Programmable Logic Controllers (PLCs) and digital circuits.



Mastering the Engineer's Toolkit

Within the advanced modules, the Candidate learns to wield powerful analytical tools to solve critical engineering problems, from optimizing power transmission to designing control systems.

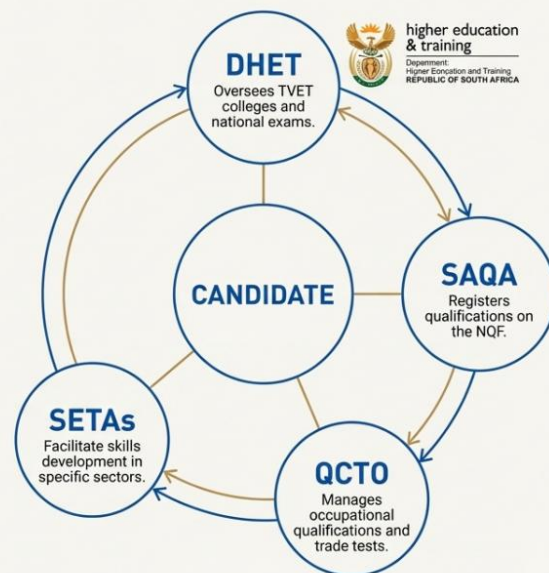
Calculus in Action: Selected N4-N6 Applications

Engineering Problem	The Mathematical Tool	Application
Calculating Power Loss in Transmission Lines	Integral Calculus $P_{loss} = \int_0^T I^2(t)R dt$	Determines the total energy lost as heat in a transmission line over a period T.
Designing AC Machine Components	Integral Calculus Torque Calculation in AC Machines	Integrals are used to calculate the average torque produced by the fluctuating magnetic fields.
Analyzing RLC Circuits	Differential Equations RLC Circuit Analysis	Models the behavior of circuits containing resistors, inductors, and capacitors, essential for designing filters and oscillators.
Simplifying Digital Logic	Boolean Algebra De Morgan's Theorems	Simplifies complex logic gate networks, leading to more efficient and cost-effective digital system design.

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Navigating the Institutional Gateway

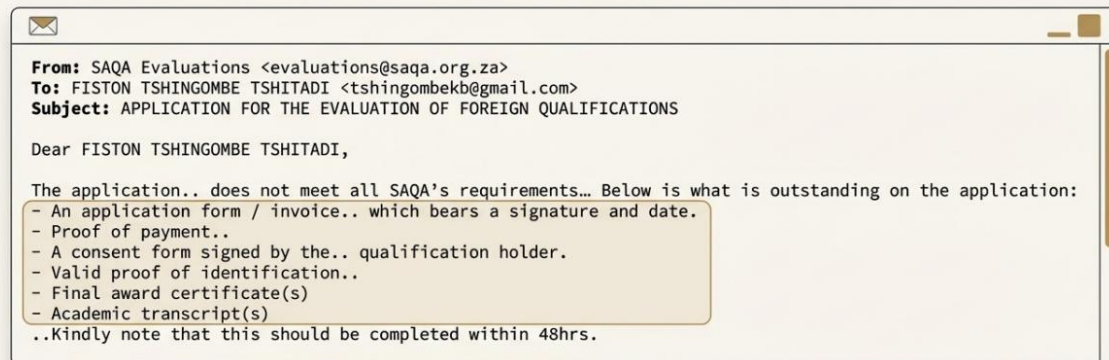
Technical skill alone is not enough. The Candidate must navigate a complex landscape of regulatory and educational bodies to have their knowledge officially validated and certified under the South African National Qualifications Framework (NQF).



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The Gatekeeper's Challenge: A Case Study

The path to qualification is paved with precise documentation. A single missing document can halt the entire process. This email from SAQA to a candidate highlights the meticulous requirements for the evaluation of foreign qualifications, a common step for many applicants.



Takeaway: This illustrates the critical importance of administrative diligence in the qualification journey.

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The Synthesis: From Knowledge to Qualification

The final qualification is awarded only after a successful synthesis of theoretical knowledge, continuous assessment, and proven workplace competence.



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The Horizon: Powering the Nation

The National N Diploma is the key to a career in vital industries that form the backbone of South Africa's economy. Qualified engineers are responsible for the generation, transmission, and distribution of electrical power.

Primary Career Destinations

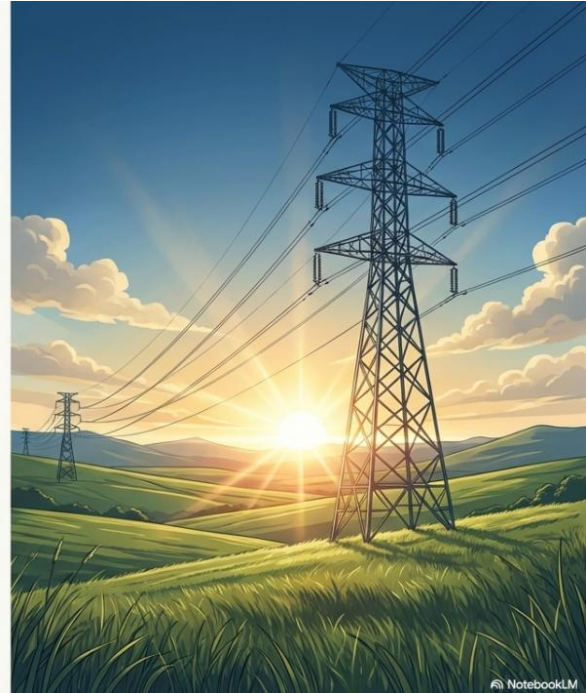


Eskom: The national power utility, responsible for generation and high-voltage transmission.

City Power: The municipal utility for Johannesburg, focused on distribution to homes and businesses.

Typical Roles

- Electrical Engineer
- Technician (Maintenance, Operations)
- Plant Operator
- Artisan Electrician
- Control and Instrumentation Technician



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Beyond the Grid: Engineering for a Modern South Africa

The problem-solving and analytical skills gained on this journey are applicable across a wide range of industries, including advanced technology, public safety, and resource management.

Mining & Industry

Applying electronics and control systems, including nanotechnology for developing advanced gas sensors to improve mine safety.



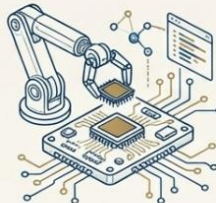
Public Safety & Defence

Specialized technical roles within the South African Police Service (SAPS) and the South African National Defence Force (SANDF).



The 4th Industrial Revolution (4IR)

Skills in electronics and logic systems are a gateway to careers in robotics, coding (Python, C++), IoT, and smart grid development.



Entrepreneurship

The qualification equips individuals with the skills to start their own businesses in areas like CCTV installation or electrical contracting.



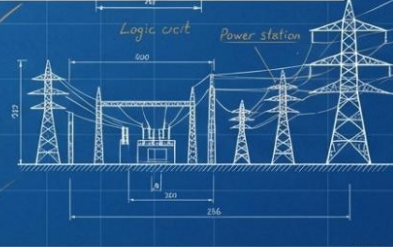
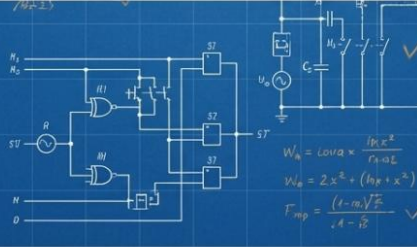
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The Completed Blueprint: A Professional Forged

The Engineer's Odyssey transforms a candidate into a qualified professional. The journey is a rigorous synthesis of:

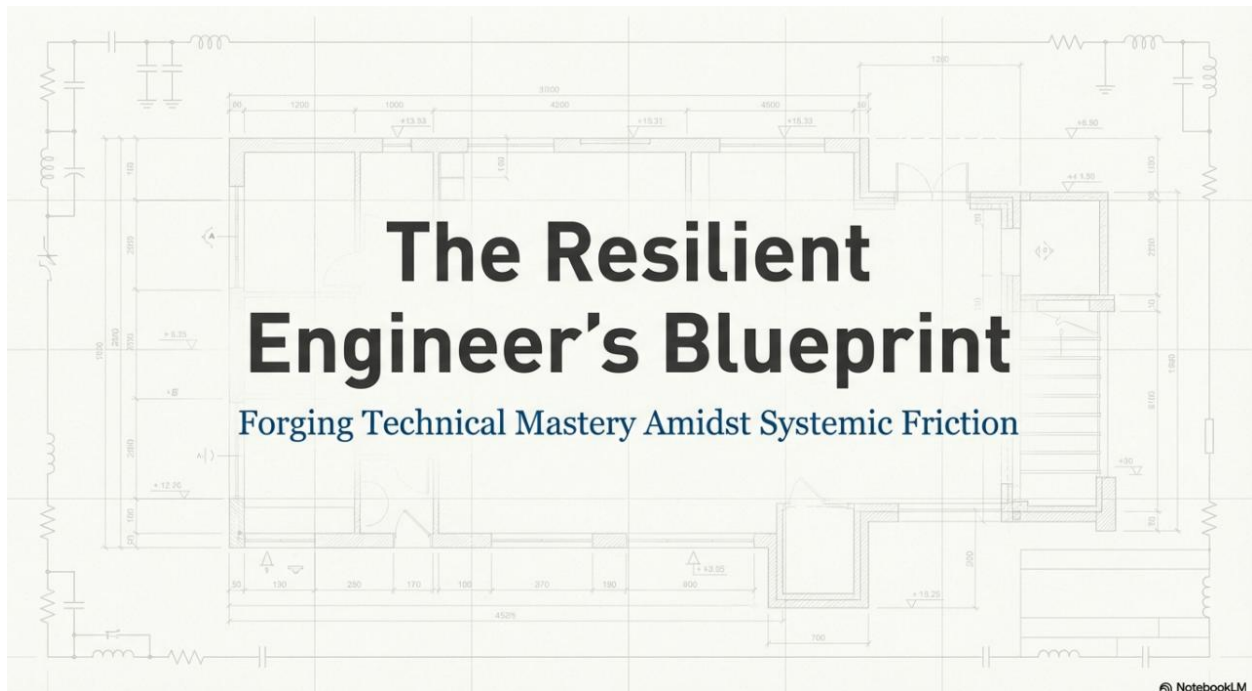
- **Advanced Theory:** The mathematical language to understand and model complex systems.
- **Practical Application:** The hands-on skill to build, maintain, and troubleshoot the nation's infrastructure, mastered through the NATED N1-N6 levels.
- **Regulatory Validation:** The official certification from bodies like SAQA and DHET, confirming a national standard of excellence.

The result is not just a diploma, but a professional ready to design, build, and maintain the future of South Africa.

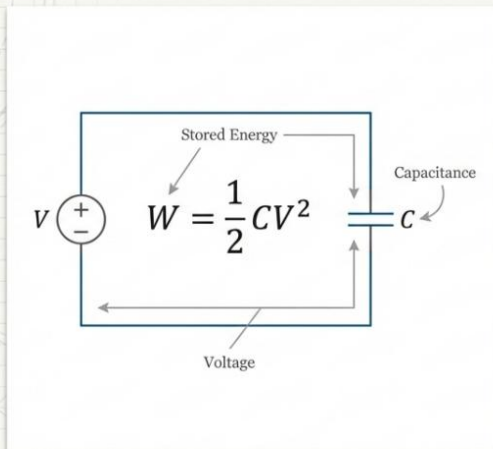


The Resilient Engineer's Blueprint

Forging Technical Mastery Amidst Systemic Friction



A TALE OF TWO WORLDS: THE ENGINEER'S REALITY



The world of elegant logic.

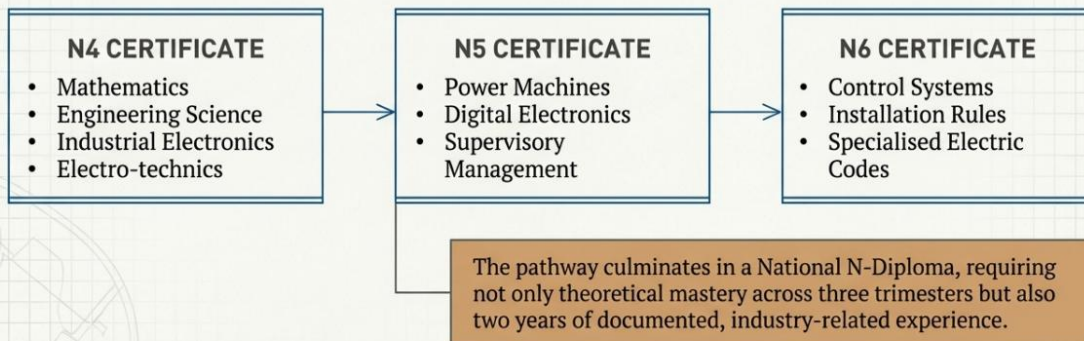
Administrative form (Case Number: GAJB26880-15) showing various stamps, signatures, and official markings, representing the world of administrative friction.

The world of administrative friction.

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The Promise of Precision: A Foundation in Engineering Principles

The N4-N6 curriculum is designed to build comprehensive theoretical and practical expertise.



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Navigating the Labyrinth: The Reality of the Qualification System

“A system plagued by decades-long certification backlogs and administrative irregularities.”

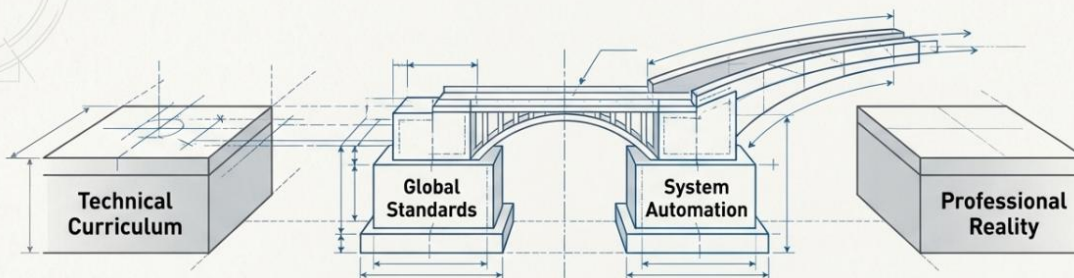
“The lived experience: Unfair dismissal disputes (CCMA), invalidated results, and paused diploma issuance.”

“The core conflict: How does one prove mastery when the system of verification is itself broken?”



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Forging the Toolkit for Resilience



Formal education provides the ‘what,’ but navigating systemic friction requires mastering the ‘how’—the frameworks for reliability, compliance, and efficiency.

1. Mastery of Global Standards (MIL-STD, IEC, IPC)

Adopting the language of mission-critical reliability to build systems that are robust by design.

2. System Automation (VBA, Logic Frameworks)

Creating tools to manage complexity, enforce compliance, and generate verifiable evidence.

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The Grammar of Reliability: Mastering MIL-STD-11991B

A framework for managing Parts, Materials, and Processes (PM&P) in mission-critical systems.



Approved Supplier

Vetted entities with procedures for authenticity and reliability.



Counterfeit Prevention

Strong emphasis on authenticity, authorized suppliers, and Certificates of Conformance (C of C) to mitigate supply chain risk.



Corrosion Prevention & Control (CPC)

A mandatory requirement embedded for long-term sustainment and lifecycle management.



COTS Evaluation

Rigorous criteria for assessing commercial off-the-shelf items before incorporation into military systems.

Key Takeaway: This standard provides the terminology anchors and audit-ready protocols for building truly resilient hardware.

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Engineering for Longevity: The Science of Derating

Derating is the practice of operating components below their maximum rated stress parameters (voltage, current, temperature) to significantly increase reliability and extend service life.

Component Type	Critical Stress Parameter	Derating Factor
Microcircuits (Linear)	Maximum Supply Voltage	0.80 (Operate at $\leq 80\%$ of max)
EMI Filters	Rated Voltage	0.50 (Operate at $\leq 50\%$ of max)
Capacitors (Ceramic)	Voltage Derating Factor	0.50 (Operate at $\leq 50\%$ of max)
Diodes (Rectifier)	Forward Current	0.50 (Operate at $\leq 50\%$ of max)

This is the difference between a product that simply *works* and a product that *endures* in demanding environments.

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The Force Multiplier: Automating Compliance and Auditing

From Manual Process to Automated Systems

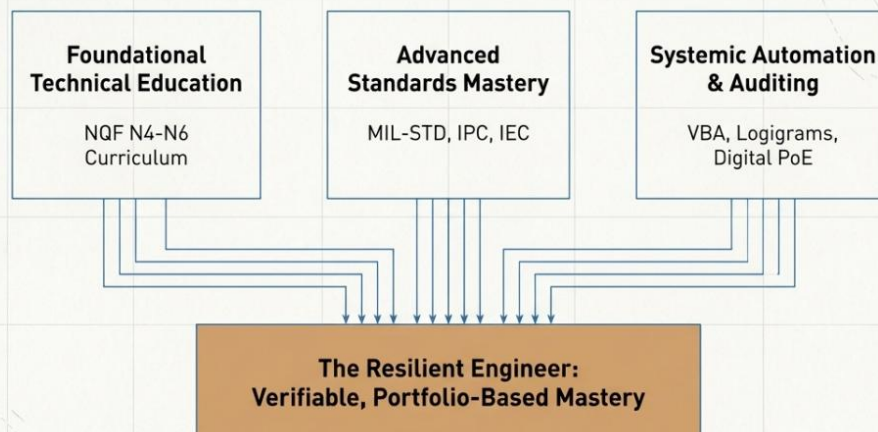
Developed custom tools using Visual Basic for Applications (VBA) to parse complex technical standards, generate audit-ready checklists, and build dynamic competency matrices.

The “So What?”: This approach transforms static documents into active, manageable systems. It automates the process of verification, making deep technical knowledge scalable and repeatable.

```
1 Option Explicit
2 Sub BuildMilStd810AuditChecklist()
3     Dim src As String, lines() As String
4     Dim i As Long, rowOut As Long
5
6     ' Prepare output sheet
7     With Sheet2
8         .Cells.Clear
9         .Range("A1").Value = "Section"
10        .Range("B1").Value = "Focus"
11        .Range("C1").Value = "Test Methods"
12    End With
13
14    ' ... code continues
15 End Sub
```

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The Blueprint: A Unified Framework for Verifiable Competence



This framework integrates formal education with the tools of global industry and the power of automation to create a new model for professional development—one that is resilient to systemic friction.

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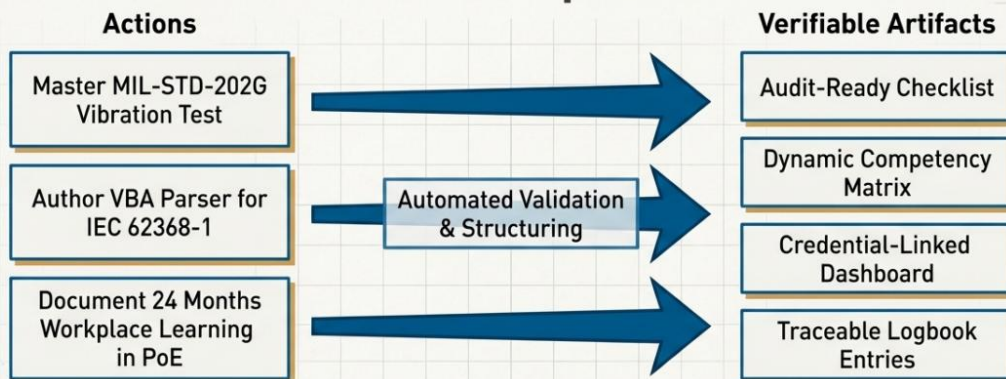
Pillar 1 in Action: Anchoring Curriculum in Global Standards

NATED N4-N6 Subject	Mapped to Real-World Application & Standard
Industrial Electronics	Selecting and derating components per MIL-STD-11991B, Appendix A.
Supervisory Management	Leading technical teams to ensure compliance with IPC-6010 Class 3 fabrication standards.
Control Systems	Designing feedback loops that meet the environmental stress requirements of MIL-STD-810H.
Installation Rules	Applying SANS 10142-1 wiring codes in environments requiring MIL-STD-461 EMC controls.

The curriculum is not just a list of subjects, but the **foundation** for applying world-class engineering practices.

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The Evidence Engine: Generating Verifiable Proof of Competence



This system shifts the burden of proof from a reliance on delayed institutional certificates to a dynamic, self-generated Portfolio of Evidence (PoE). Every skill acquired produces a tangible, auditable artifact.

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A New Archetype: The Resilient Engineer



- **Bilingual:** Fluent in both the language of pristine engineering logic and the navigation of complex administrative systems.
- **System Builder:** Does not merely follow processes, but designs automated systems to ensure compliance, manage complexity, and prove competence.
- **Evidence-Driven:** Builds a career on a portfolio of verifiable, artifact-based proof that transcends institutional delay.
- **Truly Resilient:** Possesses the integrated technical and systemic toolkit to not only survive but thrive amidst friction.

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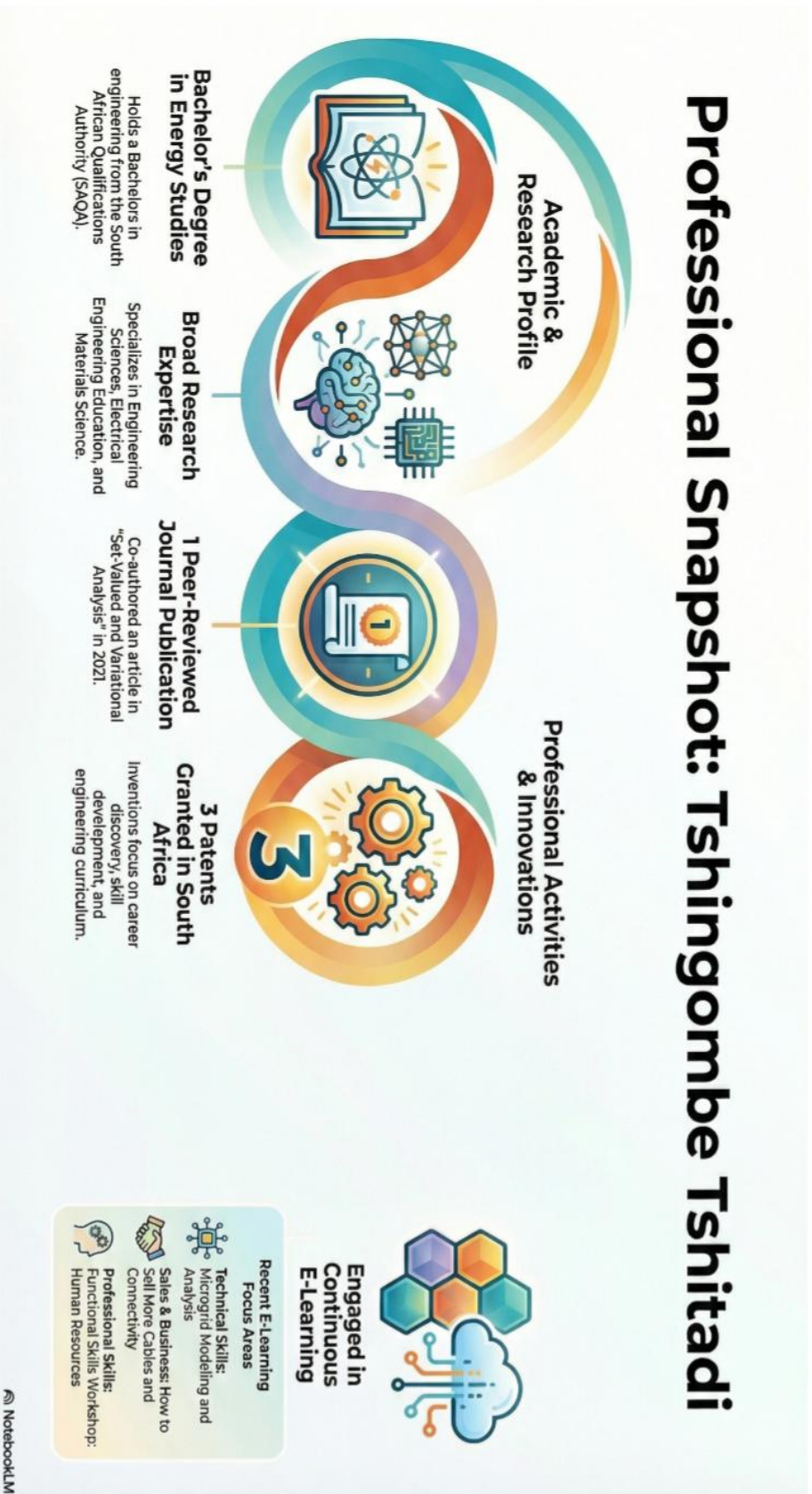
A New Archetype: The Resilient Engineer



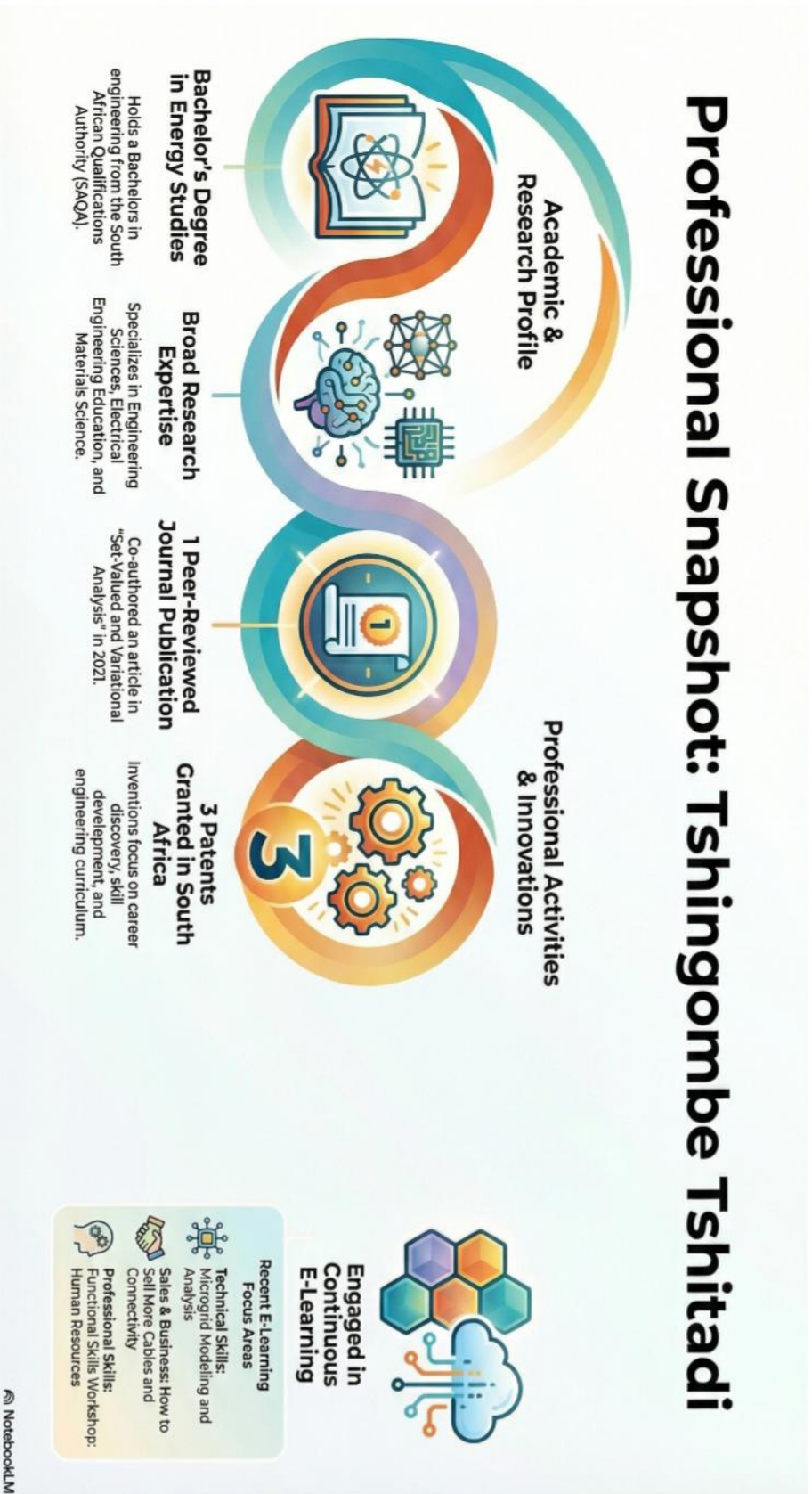
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- **Evidence-Driven:** Builds a career on a portfolio of verifiable, artifact-based proof that transcends institutional delay.
- **Truly Resilient:** Possesses the integrated technical and systemic toolkit to not only survive but thrive amidst friction.

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Professional Snapshot: Tshingombe Tshitadi



Professional Snapshot: Tshingombe Tshitadi



Printout

YOUR PATH TO A NATIONAL N-DIPLOMA IN ELECTRICAL ENGINEERING

STEP 1: ADMISSION & PROGRAM STRUCTURE



3 MONTHS PER LEVEL

A trimester timetable allows students to complete N4, N5, and N6 within one year.



R11,000 PER N-LEVEL

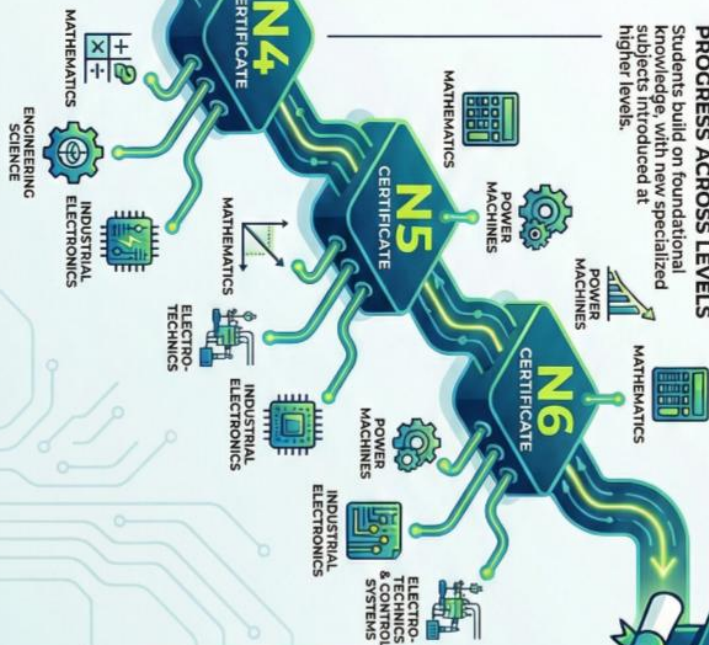
This course fee excludes the cost of textbooks, which are approximately R1500 per trimester.

N4 ENTRY REQUIREMENT: MATRIC WITH MATH & SCIENCE
An N3 pass with mathematics and science is also an acceptable entry path.

STEP 2: THE ACADEMIC JOURNEY (N4 - N6)

CORE SUBJECTS PROGRESS ACROSS LEVELS

Students build on foundational knowledge, with new specialized subjects introduced at higher levels.



STEP 3: QUALIFICATION & CAREER PATH

40% MINIMUM PASS PER SUBJECT

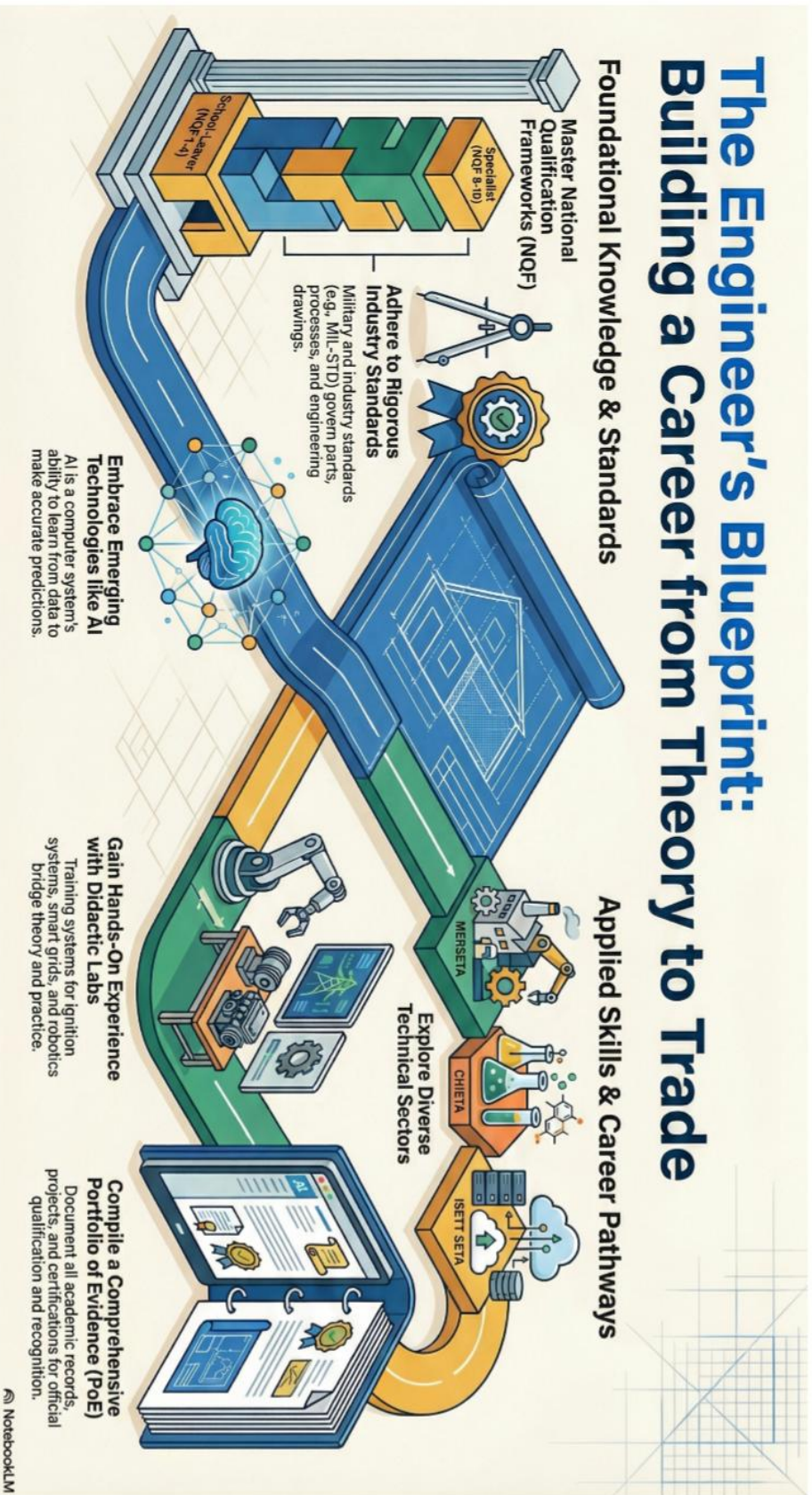
Assessment is based on class tests and a final external examination each trimester.

2 YEARS OF PRACTICAL EXPERIENCE REQUIRED

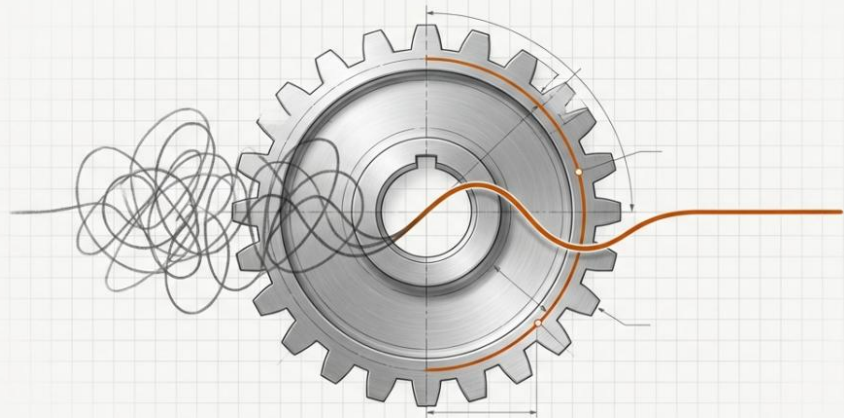
A detailed training report is required to receive the full National N-Diploma.

DIVERSE CAREER OPPORTUNITIES AWAIT
Graduates can work in industrial engineering, process control, and electrical construction.

The Engineer's Blueprint: Building a Career from Theory to Trade



The Resilient Engineer's Blueprint



Forging Technical Mastery Amidst Systemic Friction

NotebookLM

Two Worlds, One Career: The Engineer's Duality

Success in modern technical fields requires navigating a fundamental conflict: the elegant precision of engineering principles versus the unpredictable friction of the systems that govern them. This is a journey of mastering both.

Pristine Technical Mastery

Table IV. Hermetic Microcircuit and Semiconductor Requirements		
Equipment Category	Microcircuit	Semiconductor
A	MIL-PRF-38535 (Class S)	MIL-PRF-19500 (JANS)
B	MIL-PRF-38535 (Class S), MIL-PRF-38534 (Class K)	MIL-PRF-19500 (JANS)
B	MIL-PRF-38535 (Class S, B), MIL-PRF-38534 (Class K, H)	MIL-PRF-19500 (JANS, JANTXV, JANTX)
C	MIL-PRF-38535 (Class S, B), MIL-PRF-38534 (Class K, H)	MIL-PRF-19500 (JANS, JANTXV, JANTX)
D	AEC Q100, MIL-PRF-38535 (Class S, B)	AEC Q101 or MIL-PRF-19500 (JANS, JANTXV, JANTX)
E	AEC Q100, MIL-PRF-38535 (Class S, B)	AEC Q101 or MIL-PRF-19500 (JANS, JANTXV, JANTX, JAN)
T	AEC Q100, MIL-PRF-38535 (application-dependent)	AEC Q101 or MIL-PRF-19500 (application-dependent)

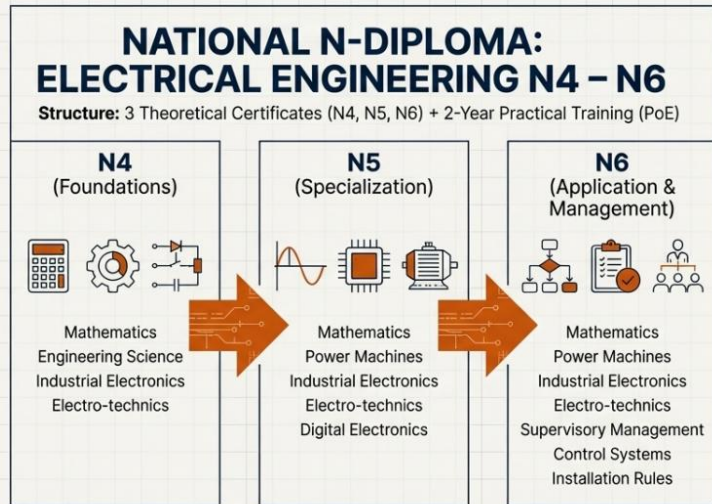
Systemic Bureaucratic Friction



NotebookLM

The Path to Mastery: A Structured Educational Framework

The National N-Diploma in Electrical Engineering provides a clear, progressive pathway from foundational theory to specialized application. The curriculum is designed to build comprehensive expertise, culminating in a qualification recognized at NQF Level 6.



Career Opportunities



Electrical Engineering
& Construction



Process
Control



Industrial Electronic
Engineering

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The Reality of the Maze: Navigating Administrative Hurdles

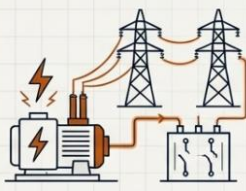
Despite a clear curriculum, the path to certification is often obstructed by systemic challenges. This requires not just technical knowledge, but resilience in the face of administrative backlogs, legal disputes, and institutional friction.



NotebookLM

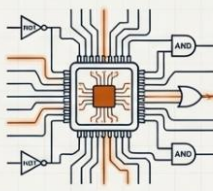
Building the Toolkit: More Than Just Theory

The N-Diploma curriculum provides the foundational toolkit. Each subject is a competency designed not just for technical execution, but for leading projects, managing systems, and ensuring compliance in high-stakes environments.



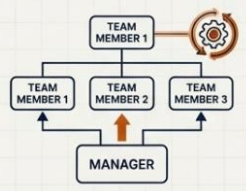
Electro-technics & Power Machines

Applied Purpose:
**Mastering Energy Systems*:*
From generation to distribution, understanding the machinery that powers industry.



Industrial & Digital Electronics

Applied Purpose:
**The Logic of Automation*:*
Designing and troubleshooting the circuits that form the brains of modern control systems.



Supervisory Management

Applied Purpose:
"Leading Technical Teams": The principles of on-site supervision, project management, and workforce organization.



Control Systems & Installation Rules

Applied Purpose:
"Ensuring Safety and Precision":
Applying national standards and automation principles to create reliable, compliant installations.

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The Language of Reliability: Mastering Military-Grade Standards

To build truly resilient systems, one must adopt the frameworks used in the most demanding environments. MIL-STD-11991B provides the definitive standard for managing Parts, Materials, and Processes (PM&P), ensuring reliability, authenticity, and lifecycle integrity from design to sustainment.

Scope

Manages PM&P for all DoD departments, covering development, production, and COTS evaluation.

Core Pillars

Strong focus on counterfeit prevention, corrosion control (CPC), and component obsolescence management.

Application

Ensures that every component, from a microcircuit to a structural bolt, meets stringent performance and reliability criteria across its entire lifecycle.

MIL-STD-11991B: Equipment Categories and Definitions

Category	Definition
A	Continuous use systems. Nonrepairable systems under space environment conditions (e.g., satellites). Must meet radiation hardness requirements.
B	Impulse (single-shot) systems. Equipment exposed to extreme launch/trajectory/return conditions. Nonrepairable once deployed.
C	Aircraft systems. Equipment exposed to turbulence, air temperature/pressure fluctuations, vibration.
D	Ground and sea-based mobile systems. Repairable systems exposed to temperature/humidity fluctuations, vibration, and shock.
E	Stationary ground systems. Repairable systems in controlled environments, readily accessible to maintenance.
T	Targets. Test-specific, non-deployable systems, sometimes exposed to extreme launch conditions.

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Precision in Practice: The Anatomy of a Military Standard

Compliance is not a high-level concept; it is a granular, data-driven discipline. Mastery requires understanding specific derating factors, material properties, and inspection protocols that guarantee performance under stress.

Table AVI. Microcircuit Derating Factors

Critical Stress Parameter	Digital	Linear
Max Supply Voltage	0.90	0.80
Power Dissipation	0.80	0.75
Max Junction Temperature	-40°C	-40°C

Table AI. Capacitor Derating Factors

Type	Voltage Derating Factor
Ceramic	0.50
Tantalum, Solid	0.50
Plastic Film	0.50
Aluminum Electrolytic	Not allowed

Table XXXI. Fungi Susceptibility of Materials

Group I – Fungus-inert materials	Group II – Fungus-nutrient materials
Acrylics	Epoxy resin
Glass	Rubbers (natural/synthetic)
Metals	Polyvinyl chloride (PVC)
Polyamide	Cellulose acetate
Silicone resin	Lubricants

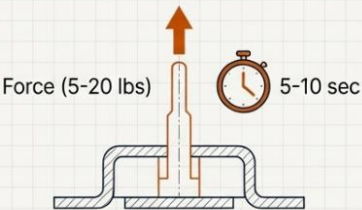
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From Document to Reality: Standardized Environmental Testing

Military standards provide repeatable, verifiable methods for testing component resilience against real-world mechanical and environmental stress, ensuring that systems survive their operational lifecycle.

Method 211A - Terminal Strength Test

Ensures terminals withstand mechanical stresses during installation.

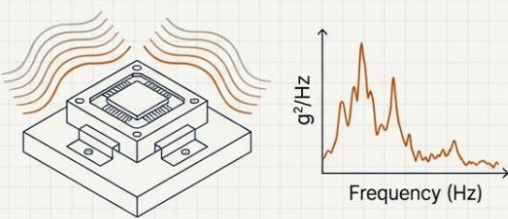


Procedure Example (Condition A - Pull Test)

A specified force is applied along the terminal axis for 5-10 seconds to detect poor workmanship or faulty design.

Method 214A - Random Vibration Test

Determines a component's ability to withstand random vibration common in aircraft and ground vehicles.



Procedure Example (Test Condition I)

Specifies Power Spectral Density (e.g., 0.04 g²/Hz for Condition B) and Overall RMS G (7.56) to be applied in three mutually perpendicular directions.

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Bridging Universes: Integrating Military and Commercial Standards

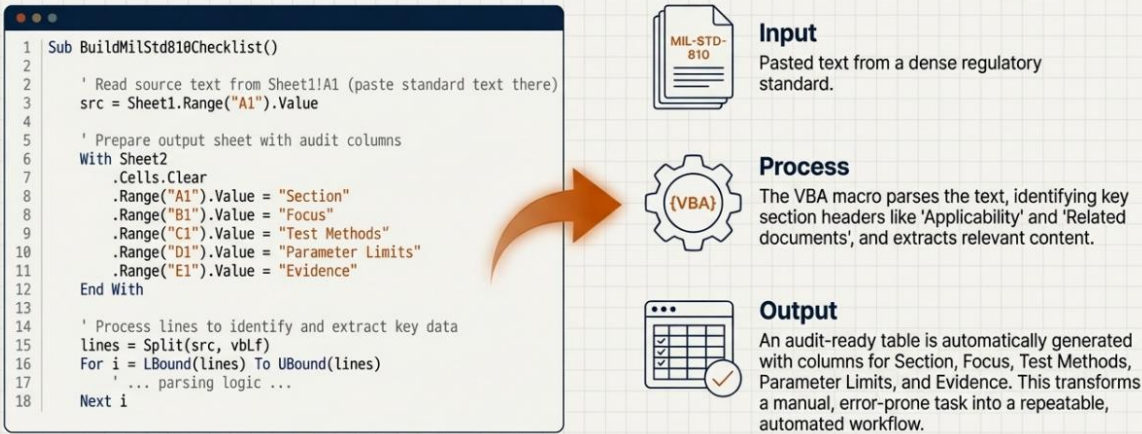
True expertise lies in synthesizing requirements across different regulatory domains. By integrating the rigorous documentation of MIL-STD-100G with the hazard-based safety engineering of IEC 62368-1, a comprehensive framework for designing ruggedized, safe, and globally compliant products emerges.

Dimension	 MIL-STD-100G (Engineering Drawings)	 IEC 62368-1:2024 (Safety Standard)
Safety Focus	Critical Safety Items (CSI) identified on drawings.	Hazard-Based Safety Engineering (HBSE).
Documentation	Prescriptive drawing formats (ASME Y14.100M).	Documentation of hazards, safeguards, and risk assessments.
Change Control	Formal revision blocks and Configuration Management.	Changes affecting safeguards require updated risk assessment.
Qualification	Source control drawings for government approval.	Testing and certification by accredited labs (e.g., CB Scheme).

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The Force Multiplier: Automating Compliance with Code

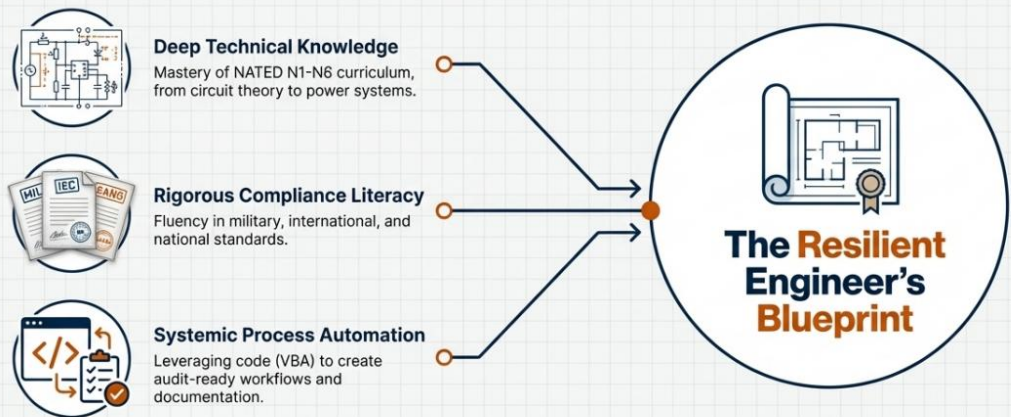
The most effective way to manage systemic complexity is to build better tools. By translating dense regulatory documents into automated routines, the process of creating audit-ready checklists and compliance artifacts can be systemized, ensuring accuracy and saving hundreds of hours.



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The Blueprint: An Integrated Framework for Resilience and Mastery

The solution is not just a collection of skills, but an integrated system. The Resilient Engineer's Blueprint combines three core pillars to create a repeatable model for navigating complex technical and administrative environments.



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Blueprint in Action I: The Competency Matrix

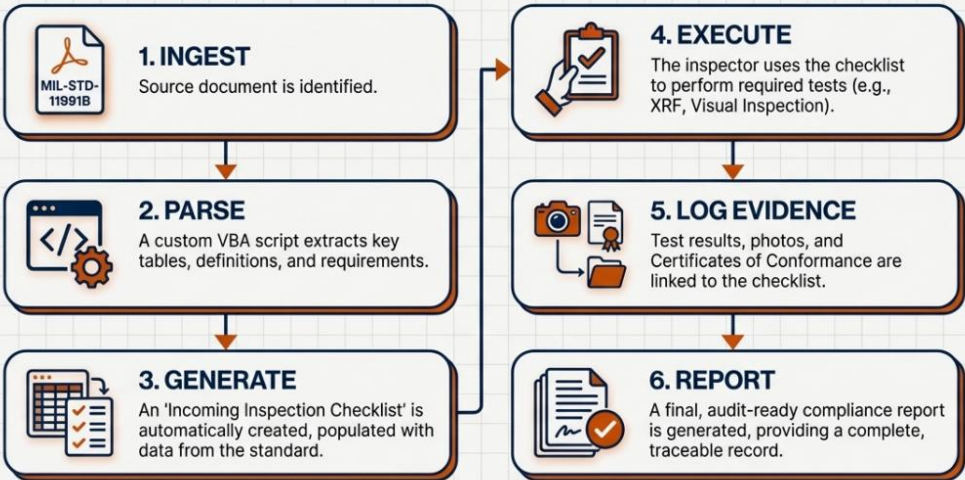
The framework translates academic learning into verifiable, industry-aligned competencies. It explicitly maps NATED curriculum modules to the specific standards and practices required in high-reliability sectors.

NATED N6 Module	Key Concepts	Linked Industry Standard	Verifiable Skill / Artifact
Industrial Electronics	Diodes, Transistors, Rectifiers	MIL-PRF-19500 (Semiconductors)	Ability to select JANTX-level components for a given design
Control Systems	PID Controllers, Feedback Loops	IEC 61508 (Functional Safety)	Design and document a control loop with a specified Safety Integrity Level (SIL)
Power Machines	Transformers, AC/DC Motors	MIL-STD-11991B, App. A	Apply derating factors for motor loads in a power budget calculation
Installation Rules	Earthing, Bonding, Protection	SANS 10142-1:2024	Create a Certificate of Compliance (CoC) for a sample installation

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Blueprint in Action II: The Audit-Ready Workflow

By automating documentation, the Blueprint transforms compliance from a reactive chore into a proactive, manageable system. This logigram illustrates the flow from raw standard to final, auditable report.



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Case Study: From Systemic Logjam to Verifiable Credential

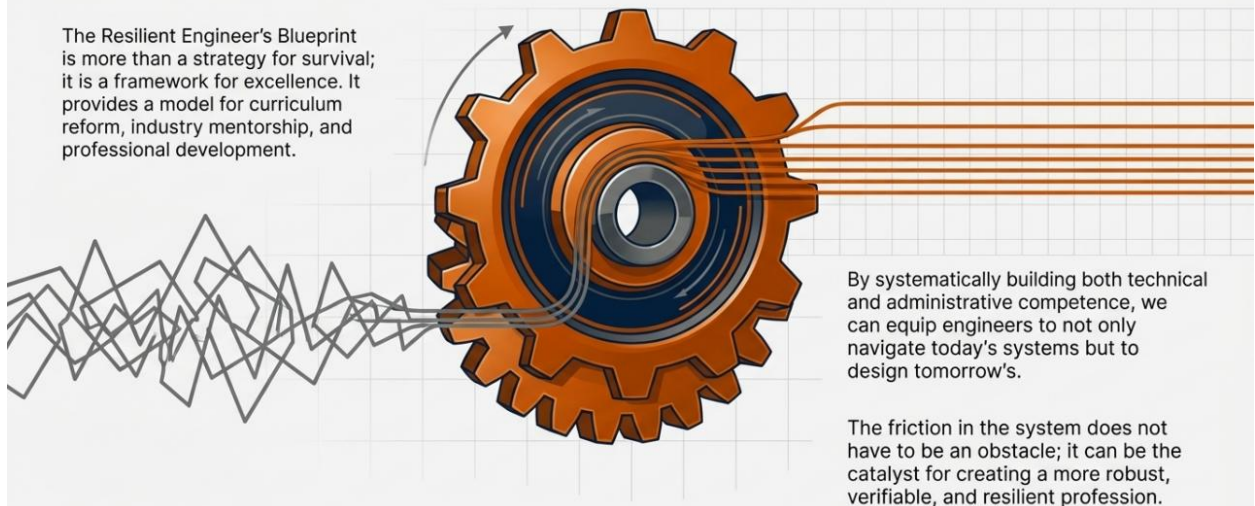
The Blueprint was applied to resolve the persistent challenge of qualification verification. By compiling a comprehensive Portfolio of Evidence (PoE) with audit-ready documentation, cross-referenced standards, and verifiable project artifacts, a clear and undeniable case for certification was presented, successfully navigating the administrative backlog.



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A Replicable Model for a New Generation of Engineers

The Resilient Engineer's Blueprint is more than a strategy for survival; it is a framework for excellence. It provides a model for curriculum reform, industry mentorship, and professional development.



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The Blueprint of a Modern Technologist

A Portfolio of Integrated Expertise: Systems Engineering, Digital Innovation, and Educational Architecture.

Tshingombe Tshitadi Fiston



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A Synthesis of Three Core Pillars

This portfolio demonstrates a unique capability: the ability to connect the unwavering discipline of defense-grade engineering standards with the dynamic potential of modern digital systems, and to architect educational frameworks that build this integrated competence in others.

1. Foundational Rigor

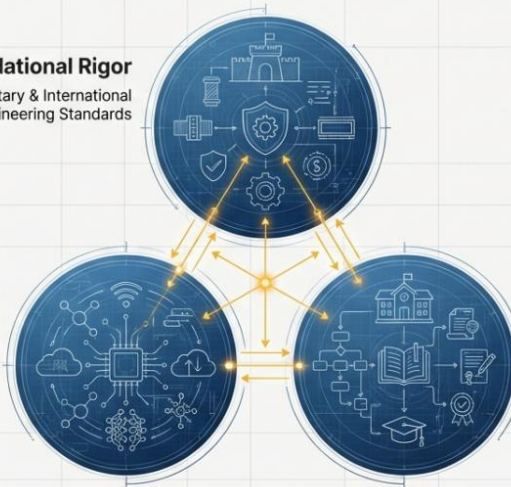
U.S. Military & International Engineering Standards

2. Modern Systems Integration

Smart Grids, IoT, AI & Industry 4.0

3. Educational Architecture

TVET Curriculum, SAQA/NQF Frameworks & Digital Pedagogy

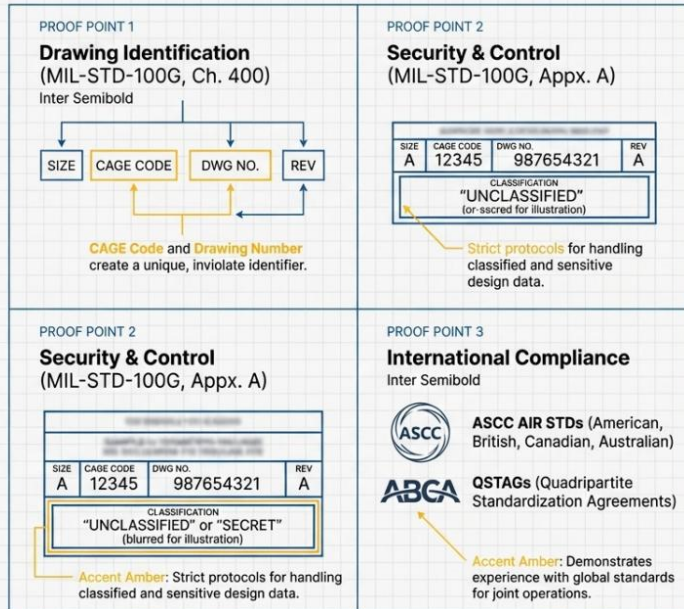


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Pillar I: Grounded in Foundational Engineering Standards

Inter Regular

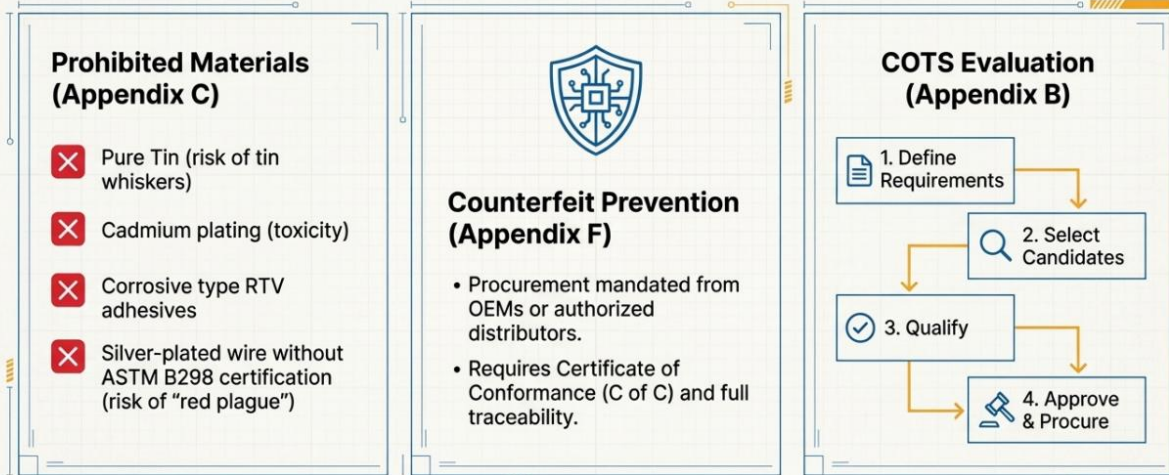
Mastery of engineering drawing standards (MIL-STD-100G) ensures absolute clarity, interoperability, and configuration management in complex defense and aerospace systems.



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Managing the Lifecycle: Parts, Materials, and Processes

A disciplined approach to Parts, Materials, and Processes (PM&P) management, aligned with MIL-STD-11991B, is critical for ensuring reliability, preventing component failure, and mitigating supply chain risks like counterfeit parts.



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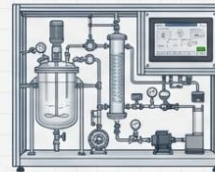
Pillar II: Engineering Modern Systems from Components Up

Translating theoretical standards into practical reality requires hands-on expertise with the core technologies of automation, energy, and process control.



De Lorenzo DL DM91 Ignition System Training Panel

Analysis and diagnostics of six distinct ignition systems, from mechanical to coil-on-plug.



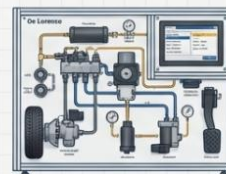
De Lorenzo DL CH12 Combined Chemical Reactor

Studying chemical reactions in stirred tank and tubular reactors with integrated SCADA.



De Lorenzo DL RENLAB Renewable Energies Laboratory

Hands-on training with photovoltaic, wind, and hydrogen fuel cell systems.



De Lorenzo DL 3155A05 Braking Power Control Board

Simulating and diagnosing ABS, ASR, and ESP systems with integrated OBD-II.

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Integrating Intelligence: Smart Grids, IoT, and Industry 4.0

The reliability of today's intelligent systems—from smart factories to national power grids—depends on the seamless integration of hardware, software, and AI, built upon a foundation of rigorously qualified components.

Smart Grid Enhanced with AI (DL SGWD-AI)



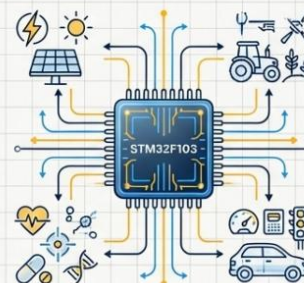
- Real-time simulation of power generation, transmission, and distribution.
- AI modules for predictive load management and fault isolation.
- Communication via industrial buses (MODBUS RTU, RS485).

Smart Factory with AI (DL I4.0 FACTORY-AI)



- Cyber-physical systems and IoT-enabled devices.
- Predictive maintenance and real-time data sharing.
- Digital twin concepts and factory automation.

Internet of Things Module (DL NGL-IOT)



- Core hardware: DevIoT unit with STM32F103 microcontroller.
- Protocols: MQTT broker/client integration.
- Applications: Energy, Agriculture, Biomedical, Automotive.

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Pillar III: Architecting the Next Generation of Technologists

Developing future talent requires a strategic understanding of the national qualification ecosystem, ensuring that curricula are aligned with industry needs and provide clear pathways for learner progression.

South African National Qualifications Framework (NQF)		
NQF Level	Qualification	Sector / Outcome
10	Doctoral Degree	Researcher / Academic
9	Master's Degree	Specialist
8	Honours Degree	Professional Engineer
7	Bachelor's Degree	Technologist
6	Diploma / Adv. Cert.	Technician
5	Higher Certificate	Entry-level Technician
1-4	General / National Cert.	Grade 9-12 / School Leaver



SAQA (South African Qualifications Authority): Oversees the development and implementation of the NQF.



QCTO (Quality Council for Trades and Occupations): Manages occupational qualifications.



DHET (Department of Higher Education and Training): The national ministry governing TVET colleges and universities.



UNESCO-UNEVOC: Referenced as a source for international TVET database information, showing global context.

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Designing Sector-Specific Career Pathways

Effective vocational curriculum design identifies scarce skills within key economic sectors and builds structured learning programs—from learnerships to apprenticeships—to fill those gaps.



MERSETA (Manufacturing, Engineering)

- **Trades**
Electrician, Pipe Fitter, Boilermaker, Diesel Mechanic.
- **Training Routes**
N1-N3 Theory → Workplace Learning → Trade Test.
- **Key Document**
Learnership Agreement (Tripartite contract between learner, employer, provider).



CHIETA (Chemical Industries)

- **Scarce Skills**
Chemical Engineering, Instrument Mechanician, Ammunition Fitter.
- **Example Qualification**
National Certificate: Ammunition Fitting.
- **Industry Focus**
Explosives, Pharmaceuticals, Petroleum.



INSETA (Insurance)

- **Career Options**
Underwriter, Actuary, Financial Advisor, Loss Adjustor.
- **Learning Pathway**
NQF Level 4 (Long-Term Insurance) → NQF 5 (Wealth Management) → Regulatory Exams (RE1, RE3).

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Integrating Digital Fluency into Modern Curriculum

To prepare learners for the future, technical education must embed digital literacy at its core. This includes not just using software, but understanding the foundational concepts of AI and Machine Learning.

Visual Evidence



Core Concepts

Program Overview

Partnership with Microsoft to deliver 6 AI certifications covering fundamentals, generative AI, and responsible AI.

Core Concepts Taught

AI vs. Intelligence

Referencing the 'Chinese Room Argument' to distinguish between rule-following and true understanding.

Data as Fuel

Explaining that AI relies on massive, refined datasets to learn and predict.

Types of Machine Learning

- **Supervised:** Learning with a coach
- **Unsupervised:** Learning by observation
- **Reinforcement:** Learning from rewards/penalties

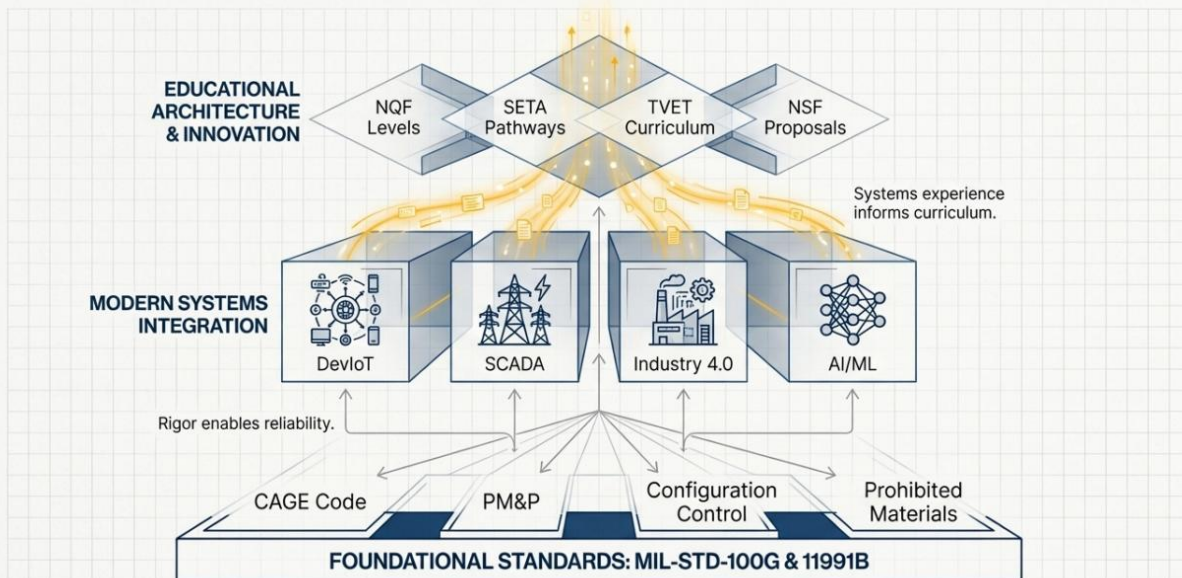
Applying DevOps & Cloud Tools for Project Management

Principle: Modern engineering and curriculum development projects require robust version control, automated pipelines, and cloud-based collaboration tools to manage complexity and ensure quality.



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The Integrated Blueprint: From Standards to Systems to Skills



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A Vision for a National Challenge: An NSF Proposal Framework

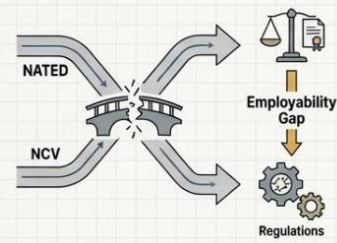
The synthesis of these capabilities culminates in a vision to address a critical national challenge: harmonizing South Africa's vocational education system to meet the demands of the 4th Industrial Revolution.

Project Title

Implementation and Framework for National Qualification and National Trade Examination Curriculum: A Blended Learning Model for TVET in South Africa.

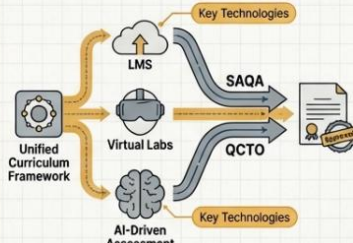
Problem Statement

Disparities between NATED (academic) and NCV (practical) qualifications, outdated trade theory, and policy irregularities hinder learner employability and industry readiness.



Technical Innovation

Develop a unified curriculum framework leveraging an LMS, virtual labs, and AI-driven assessment tools to integrate theoretical knowledge (NATED) with hands-on skills (NCV), aligned with SAQA and QCTO standards.



Broader Impacts

Enhance the pipeline of skilled technicians for strategic sectors (Energy, Manufacturing, ICT), improve national competitiveness, and provide clear, equitable career pathways for TVET learners.



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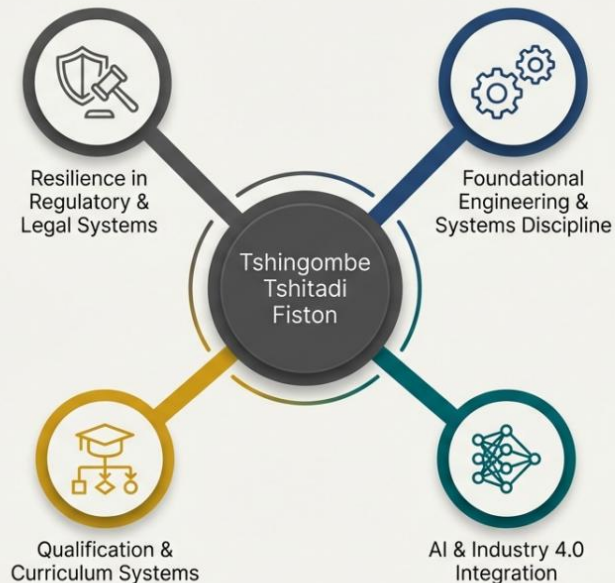
The Systems Integrator: Bridging Engineering, Defense, AI, and Compliance

A Professional Profile of Tshingombe Tshitadi Fiston

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A Unique Nexus of Multidisciplinary Expertise

In a world of hyper-specialization, true innovation comes from those who connect the dots. This profile presents Tshingombe Tshitadi Fiston as a central hub integrating four critical domains. Each area represents a deep well of knowledge and practical application, but his core strength lies at their intersection.



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Foundations in Engineering & Systems Discipline

A Foundation Forged in Precision: Mastering Military-Grade Engineering Standards

A deep understanding of Department of Defense (DoD) standard practices forms the bedrock of a disciplined approach to engineering. This involves mastery over the entire lifecycle of technical documentation, from preparation and revision to numbering, coding, and security classification.

MIL-STD-100G

Engineering Drawings

- **Numbering & Identification:** Expertise in DoD requirements for engineering drawings, associated lists, and product definition data, including CAGE Code, Part or Identifying Number (PIN) structure, and drawing number assignment for unique identification and configuration control.
- **Security Protocols:** Application of security classification markings and notations on drawings and associated lists (Appendix A).
- **Qualification & Sourcing:** Understanding of qualification provisions for source control drawings, ensuring multiple sources of supply and spare part availability (Appendix B).

MIL-STD-11991B

Parts, Materials & Processes

- **Counterfeit Prevention:** Procedures for avoiding, detecting, and containing counterfeit parts and materials.
- **Prohibited Materials:** Awareness of restricted materials (e.g., specific aluminum alloys, cadmium plating, corrosive RTVs) to ensure system reliability.
- **COTS Evaluation:** Criteria for evaluating Commercial Off-The-Shelf items for integration into military systems.

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From Theory to Practice: Applying Systems Thinking to Technical Challenges

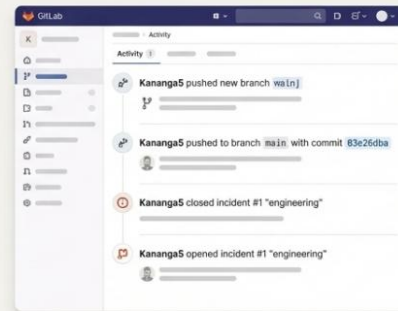
A disciplined foundation is only valuable when applied. This expertise is demonstrated through hands-on work in electrical and electronic systems, a commitment to modern development practices, and the systematic compilation of evidence.

Practical Electrical Engineering

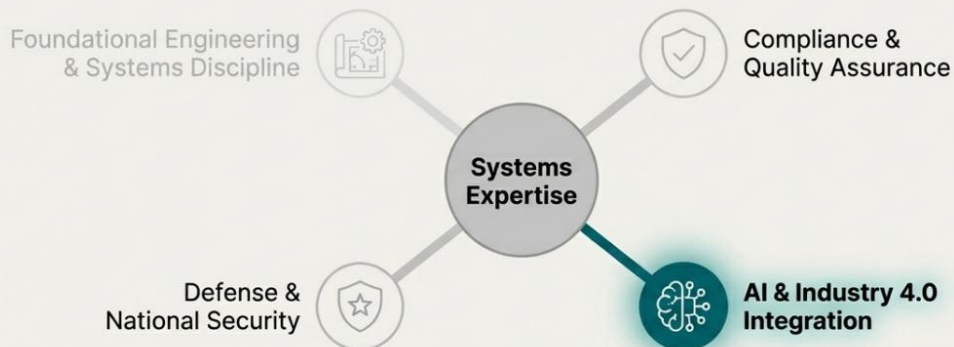
- Comprehensive training in electrician trade theory (NSQF Level 5), covering:
 - Circuit Analysis (Ohm's & Kirchhoff's Laws),
 - Component & System Knowledge (capacitors, 3-phase AC), and
 - Safety & Standards (5S, NEC).

Modern Development Workflow

- Active use of contemporary software development and project management platforms: GitLab for managing an engineering database repository (issue tracking, merge requests, CI/CD) and Azure DevOps for work item tracking and project management.



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Building on a foundation of engineering discipline, the next layer of expertise focuses on integrating the technologies of the future.

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Acquiring the Language of the Future: Fluency in Artificial Intelligence

True integration of AI requires more than buzzwords; it demands a fundamental understanding of its principles, applications, and ethical considerations. This is demonstrated through completion of a comprehensive AI fluency program in partnership with Microsoft and Sci-Bono.

Core Concepts Mastered

- **AI Fundamentals:** Differentiating true AI from simple automation.
- **Knowledge vs. Intelligence:** Understanding the distinction through frameworks like John Searle's 'Chinese Room Argument'.
- **The Role of Data:** Recognizing data as the 'fuel for AI,' essential for pattern recognition, prediction, and learning.
- **Machine Learning Models:** Mastery of Supervised, Unsupervised, and Reinforcement Learning.

Proof Point: 6 AI Certifications (Sci-Bono & Microsoft)



AI Basics



Generative AI



Internet Search and Beyond



Responsible AI



Microsoft Copilot



AI For All

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— AI & Industry 4.0 Integration

Implementing Intelligence: From AI-Enhanced Smart Grids to Smart Factories

The value of AI is realized when applied to solve real-world industrial challenges. This is demonstrated through proficiency with advanced didactic laboratories that simulate and test the integration of AI into critical infrastructure and manufacturing processes.

Smart Grid Enhanced with AI (DL SGWD-AI)



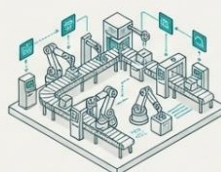
Capability

- Combines traditional electrical networks with AI-driven data analytics for predictive load management and fault isolation.

Skills

- Designing intelligent distribution networks, implementing AI algorithms for grid optimization, evaluating cybersecurity via MODBUS RTU and SCADA-WEB platforms.

Smart Factory Enhanced with AI (DL I4.0 FACTORY-AI)



Capability

- Simulates modern manufacturing environments using Cyber-Physical Systems and IoT-enabled devices.

Skills

- Managing smart production lines, using AI for process optimization and predictive maintenance, understanding digital twin concepts.

AI Development Laboratory (DL AI-BASE & DL AI-2.0)



Capability

- A challenge-based learning environment for building and training AI models for industrial applications.

Skills

- Hardware/software integration for AI experimentation in anomaly detection and efficiency improvement.

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Beyond technical application, a systems thinker must also understand and shape the frameworks that develop human capital.

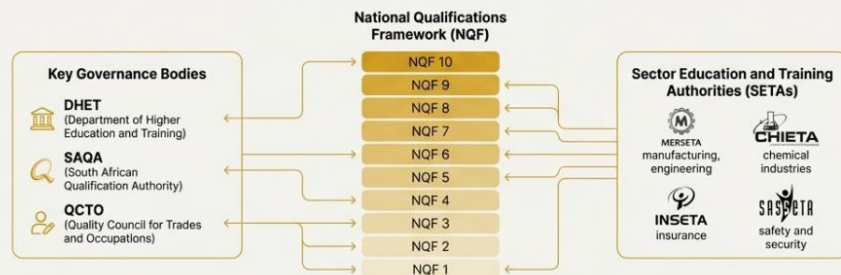
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Qualification & Curriculum Systems

Navigating the National Framework: Expertise in Qualification and Accreditation

Effective technical development requires a holistic understanding of the national ecosystem for education and training. This involves deep familiarity with the qualification frameworks, quality councils, and sectoral authorities that govern skill development in South Africa.

The SA Educational Ecosystem



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Architecting Future Skills: From Curriculum Reform to Research Proposals

True systems integration involves not just navigating existing structures but actively contributing to their evolution. This is demonstrated through formal research proposals aimed at advancing technical education and aligning vocational training with the demands of Industry 4.0.

Initiatives & Research

Thesis Proposal

A research proposal titled "Implementation and framework national qualification and national trade examination curriculum..." aimed at creating a more integrated and effective model for TVET education in South Africa.

NSF Project Pitch (Ref: 00095759)

An Advanced Manufacturing pitch addressing the need for an improved framework for NATED & NCV qualification systems, proposing a new system to resolve backlogs and inefficiencies in the TVET assessment model.

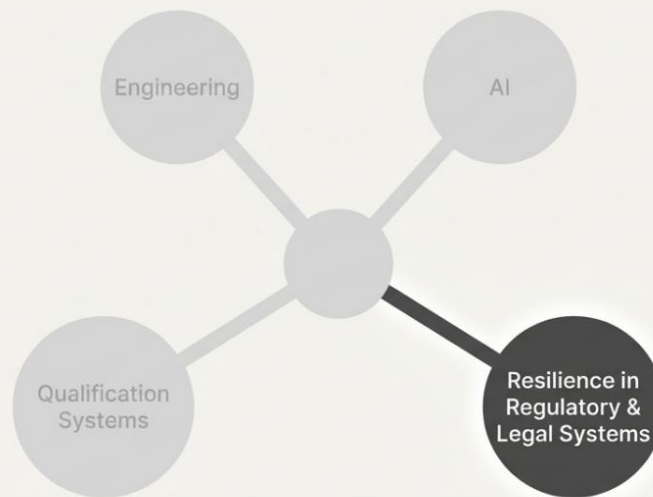
NRF Funding Applications

Active engagement with the national research community through submissions to the National Research Foundation, including applications for Institutional Grants.

My Applications | NRF Connect

Reference	Applied Date	Status
FBIC250410310077	10/04/2025	Application Complete
NFSG250411310257	11/04/2025	Application In Progress
AUPP250414310636	14/04/2025	Application In Progress

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Technical and systemic knowledge must be paired with the **resilience** to navigate the complex, often adversarial, world of legal and regulatory challenges

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Resilience Under Pressure: Navigating Complex Legal and Institutional Challenges

Professional careers are often tested by legal and administrative hurdles. The ability to methodically navigate these challenges is a critical skill, demonstrating perseverance and an understanding of formal procedures.

Case Study: Labour Court Appeal (JR 2461/15)

- **Challenge:** Contesting an unfair dismissal dispute with the CCMA and escalating to the Labour Court.
- **Demonstrated Skills:**
 - **Procedural Navigation:** Successfully filing a referral outside the 30-day limit (requiring a condonation application) and managing the case through multiple stages.
 - **Document Preparation:** Compiling and submitting comprehensive legal filings, including a "Notice of Motion," "Affidavit," "Leave to Appeal," and "Heads of Argument."
 - **Evidence Management:** Systematically organizing a "Pleading Index & Casebook" with meticulous page references for all legal documents, demonstrating high-level administrative competence.

"The applicant has a history of no attendance at hearing and shows a disregard for the court process."
(from Judgement)



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Resilience in Regulatory & Legal Systems

Driving Compliance and Verification: From Foreign Qualifications to Data Protection

Navigating institutional systems extends from legal disputes to qualification verification and modern data compliance. Each interaction is an opportunity to demonstrate meticulousness and a commitment to meeting established standards.

SAQA Foreign Qualification Evaluation



This multi-step process demonstrates persistence in the face of bureaucratic obstacles by systematically addressing feedback to achieve compliance.

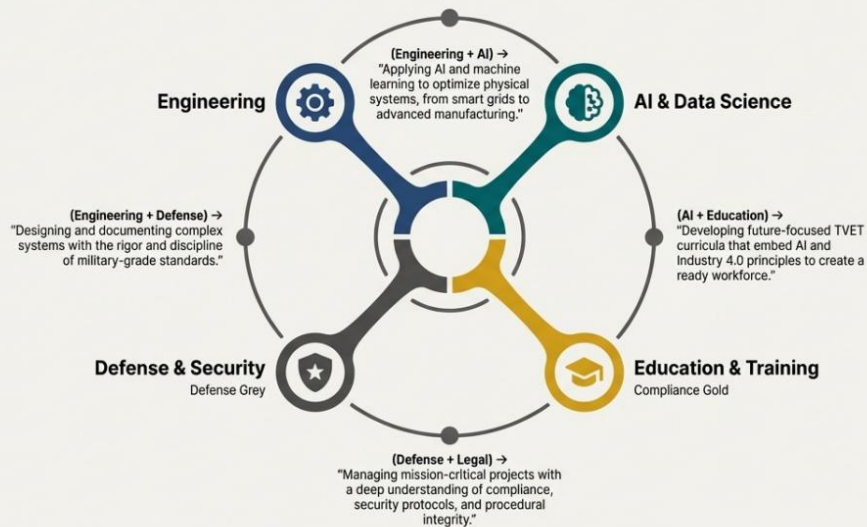
Broader Standards Compliance



Knowledge extends to documentation for professional registration and licensing, complemented by formal training in the Protection of Personal Information Act (Act No. 4 of 2013).

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The Synergistic Advantage: Connecting Domains for Unprecedented Value



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A Systems Integrator Ready for the Next Complex Challenge

A rare professional fluent in the languages of engineering, defense systems, artificial intelligence, and regulatory frameworks. Possesses a proven ability to analyze, navigate, and innovate within complex, multi-layered environments.



Disciplined & Methodical

Grounded in military and engineering standards.



Technically Fluent

Proficient in both traditional engineering and emerging AI technologies.



Systemically Aware

Understands the intricate networks of education, accreditation, and compliance.



Demonstrably Resilient

Proven capacity to overcome significant legal and bureaucratic challenges.

Ready to lead projects at the intersection of technology, compliance, and strategic development.

Email: tshingombefiston@gmail.com
Portfolio: [\[Link to GitLab/Archive.org\]](#)

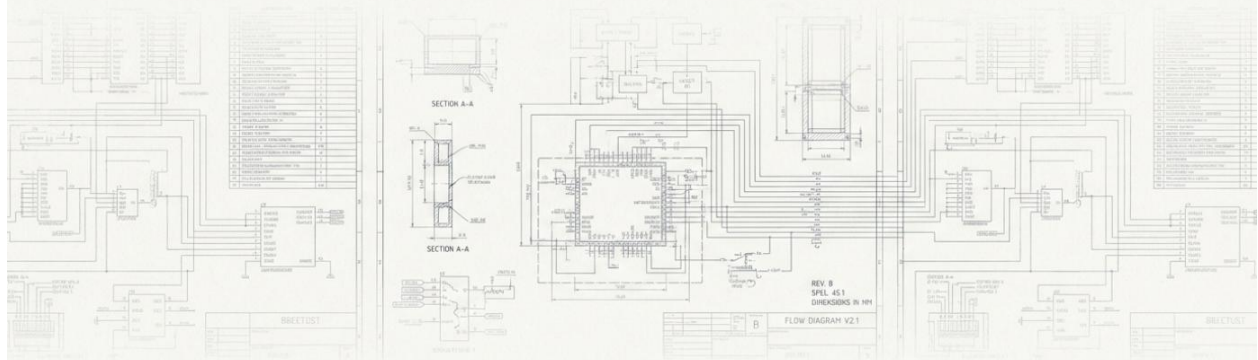
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⚙️ Innovation & Invention in Trade Engineering	6
📄 Quiz, Marking & Evaluation	6
📄 Curriculum Assessment	6
🌐 Conclusion	6

The Audit-Grade Career Engine

A Blueprint for Verifiable Competence



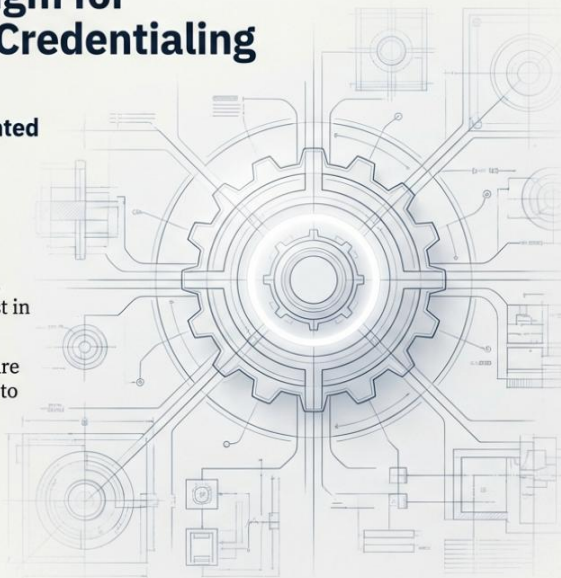
A modular framework that synthesizes formal education, vocational training, and workplace experience into a single, auditable system.

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A New Paradigm for Professional Credentialing

The Challenge: Fragmented Competence

- Resumes are static, self-reported, and difficult to verify.
- Formal qualifications (e.g., diplomas, certificates) exist in siloed databases.
- Practical, hands-on skills are rarely quantified or linked to formal credentials.

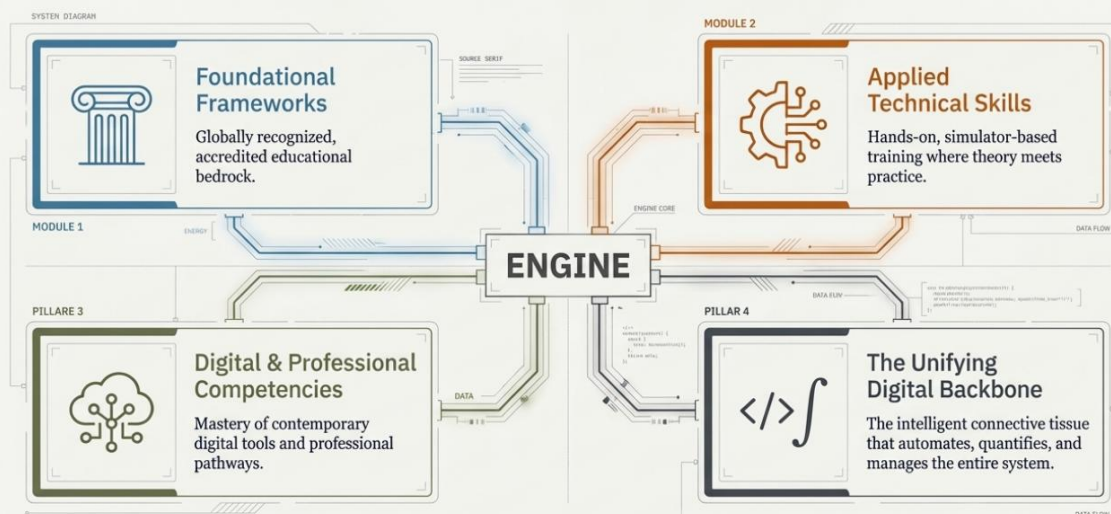


The Solution: An Integrated, Data-Driven System

- A modular system that maps every skill, qualification, and experience to a verifiable data point.
- Utilizes a quantitative backbone to measure outcomes, from project costs to energy harvested.
- Generates audit-grade documentation for accreditation bodies like SAQA, AIU, and ASIC.

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The Four Pillars of the Career Engine



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Pillar 1: Foundational Frameworks

Building on a Bedrock of Global Academic Standards

French Higher Education

Brevet de Technicien Supérieur (BTS)

A Level 5 national diploma specializing in technical fields. The curriculum is structured in “blocs de compétences” (competency blocks), allowing for modular validation.

BTS Électrotechnique - Compétency Block

RNCP41007BC01

Étude et conception préliminaire d'une installation
(Preliminary study and design of an installation)



South African Qualifications Authority (SAQA)

National Qualifications Framework (NQF)

Defines national standards for qualifications and facilitates the articulation and portability of credits across institutions and workplaces.

NQF Unit Standard Example

Qualification	National Certificate: Electrical Engineering (ID 72071)
Unit Standard ID	259037
Title	Design and install electrical wire ways
Level	NQF Level 3
Credits	8

NotebookLM

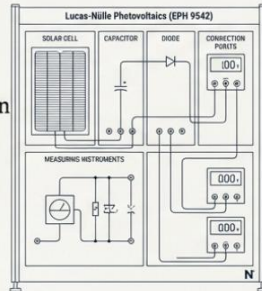


Pillar 2: Applied Technical Skills

From Didactic Theory to Real-World Diagnostics

German Didactic Systems (Lucas-Nülle)

Leveraging the UniTrain and InsTrain modular learning systems for hands-on experimentation in electronics, automation, and renewable energy. The system includes guided fault simulation and real-time diagnostics.



Indian Vocational Training (ITI)

Incorporating the National Instructional Media Institute (NIMI) curriculum for Electrician Trade (NSQF Level 5), which emphasizes structured practical exercises in wiring, soldering, and workshop safety.

NIMI Curriculum: Electrician (NSQF Level 5)

Module No.:	3
Module Title:	Wires, Joints - Soldering - U.G. Cables
Allocated Time:	125 Hrs

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Pillar 3: Digital & Professional Competencies

Mastering the Tools of the Contemporary Digital Economy



Enterprise Cloud Platforms

Structured learning through Salesforce Career Pathways, developing specialized skills in areas like **Salesforce Technical Architect**, covering System Architecture, API Integration, and ETL.



Advanced Computing Paradigms

Deep knowledge in **Cloud Computing & Big Data**, including Hadoop and Spark. Expertise in **Spatial Computing**, covering GIS applications in telecommunications for network optimization and location-based services.



BlockMark
Technologies

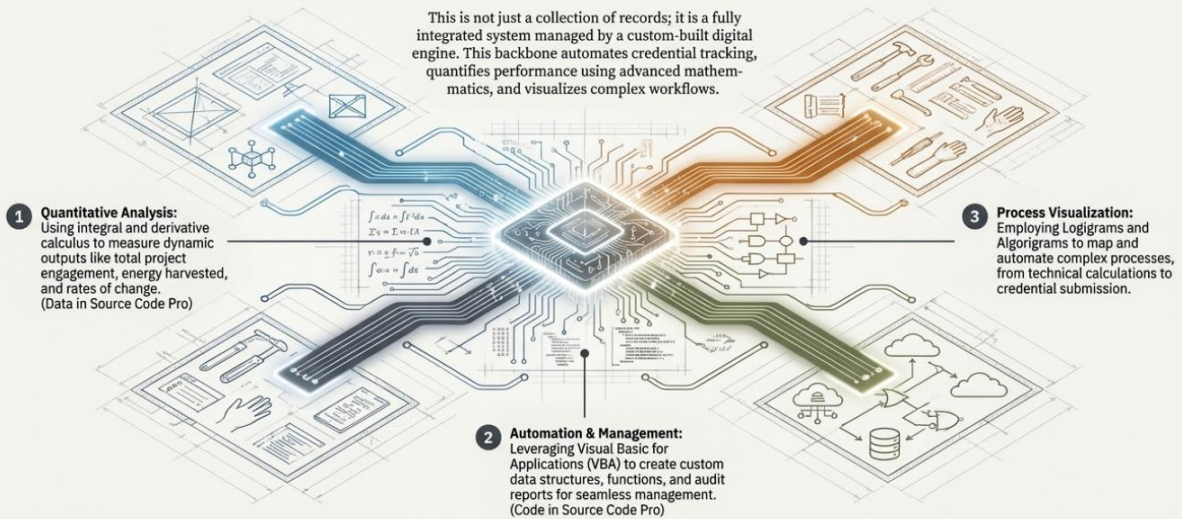
Digital Credentialing

Utilizing modern platforms for verifiable digital credentials, including **BlockMark Technologies** for issuing blockchain-stamped certificates and **Cyber Essentials** for security validation.

NotebookLM

Pillar 4: The Unifying Digital Backbone

The Intelligent Connective Tissue: Code, Calculus, and Logic



NotebookLM

The Engine's Logic: Quantifying Performance with Code and Calculus

Credential & Calculation Tracking

```
' Module: CredentialDashboard
Type CalculationRecord
  DateStamp As Date
  Topic As String
  MethodUsed As String
  SimulationTool As String
  ResultSummary As String
  Award As String
  RewardPoints As Integer
End Type

Function WindEnergyHarvest(rho As Double, A As Double, v As
Double, eta As Double, duration As Double) As Double
  WindEnergyHarvest = 0.5 * rho * A * (v ^ 3) * eta * duration
End Function
```

A Quantitative Approach

Total Engagement Over Time:

$$E_{\text{total}} = \int_0^T E(t) \, dt$$

Total Energy Harvested (Wind):

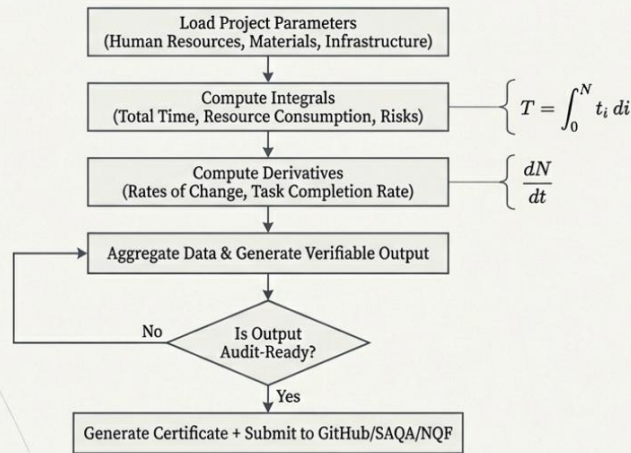
$$E = \int_0^T \frac{1}{2} \rho A v^3 \eta \, dt$$

Rate of Task Completion:

$$\frac{dN}{dt}$$

NotebookLM

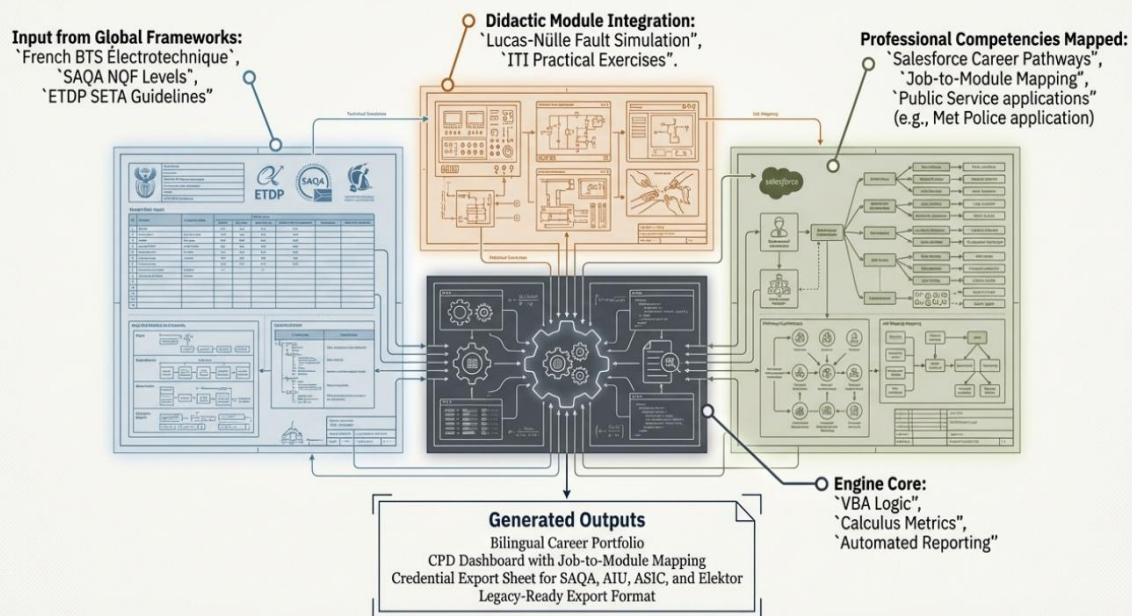
Visualizing the Workflow: An Automated, End-to-End Process



This automated workflow ensures every credential is the product of a traceable, data-driven, and verifiable process.

NotebookLM

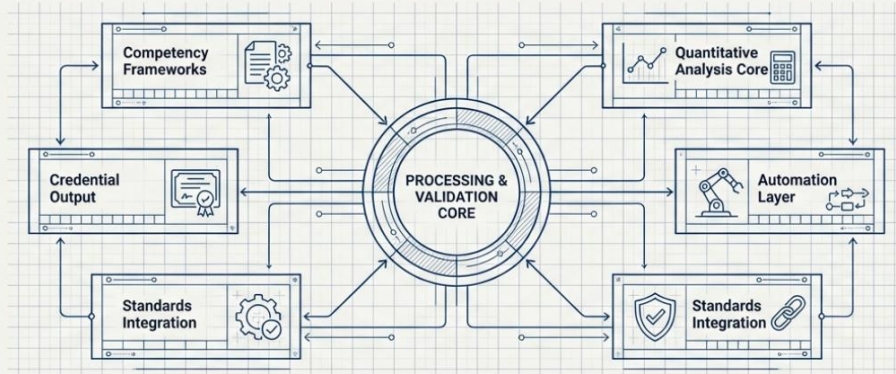
The Complete Blueprint: A Synthesized Career Dashboard



NotebookLM

The Architecture of a Career: An Integrated Credentialing Engine

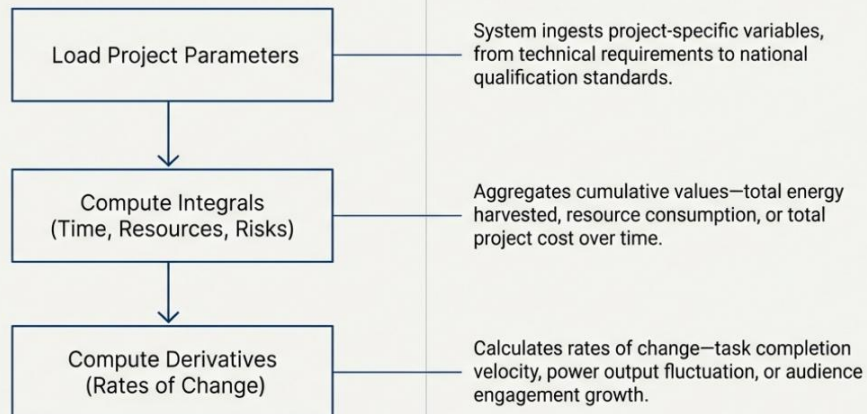
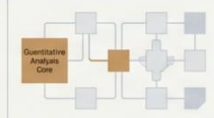
A modular, automated system for audit-grade skill validation and professional development across complex global domains.



This format supports audit-grade tracking across engineering, education, energy, and public service domains.

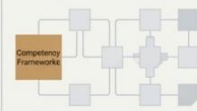
NotebookLM

The Core Logic: A Modular Calculation Flow



NotebookLM

Module 1: Deconstructing Expertise into Verifiable Competency Blocks



Supply Chain Management: Masters in Supply Chain Management and Traceability

Focusing on the integration of software engineering principles with supply chain management writing supply chain management... design and implementation of traceability systems.



Spatial Computing in Telecommunications

Utilizing spatial data to design more efficient and reliable telecommunications networks, entieming the reliable telecommunications networks... applying spatial analysis to optimize the allocation of network resources.

Spatial Data

GIS in Telecom

5G and Spatial Computing



Genetic Engineering and Manufacturing

Explores the manufacturing techniques specific to biopharmaceuticals, excolories the nate-and cipating challenges and strategies involved... challenges and strategies involved in scaling genetic engineering products from laboratory to market.

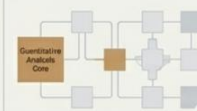
Fermentation Technology

Scale-Up and Commercialization

Quality Control

NotebookLM

Module 2: Applying Consistent Quantitative Analysis Across Domains



Renewable Energy

Total Power Output:

$$P_{\text{total}} = \int_0^T P(t) dt$$

Calculates total energy harvested by integrating power output over a specific time period.



Project Management

Total Cost Estimate:

$$C_{\text{total}} = \sum (M_{\text{material}} + H_{\text{human}} + S_{\text{stationery}} + B_{\text{building}})$$

Aggregates cost projections across all resource categories for a complete financial overview.



Social Media Marketing

Total Engagement:

$$E_{\text{total}} = \int_0^T E(t) dt$$

Measures cumulative audience engagement by integrating the rate of interaction over the campaign duration.



Telecommunications

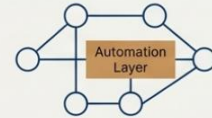
Doppler Shift Compensation:

$$f_d = \frac{v}{c} f_s$$

Applies precise physics-based calculations to manage signal frequency in mobile communication networks.

NotebookLM

Module 3: The Automation Layer - Structuring Data for Audit and Export



Visual Basic Logic Snippet (Credential Tracker)

```
Type CalculationRecord
  DateStamp As Date
  Topic As String
  MethodUsed As String
  OptimizationType As String
  SimulationTool As String
  ResultSummary As String
  Award As String
  RewardPoints As Integer
  Notes As String
End Type
```

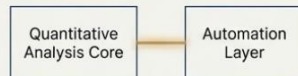
Visual Basic Logic Snippet (Social Media Dashboard)

```
Type MarketingRecord
  DateStamp As Date
  Platform As String
  CampaignName As String
  ContentType As String
  EngagementRate As Double
  ...
  CredentialLinked As Boolean
End Type
```

The system uses strongly-typed data structures in Visual Basic to ensure every record is complete, consistent, and ready for automated processing, credential linking, and export to external verification bodies.

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Case Study: An Integrated View of a Bilingual Engineering Project



Project Dashboard

Metric 1: Total Time:

$$T = \int_0^N t_i di$$

(Total project time across N tasks)

Metric 2: Task Completion Rate:

$$\frac{dN}{dt}$$

(Rate of task completion over time)

Metric 3. Human & Material Resources:

$$R = \int_0^T r(t) dt$$

(Total resource consumption)

Sourced from Automated Cost Estimator

👤 Human Resource / Ressources humaines :
\$ [Currency Value]

🔧 Material / Matériel : \$ [Currency Value]
Value]

✍ Stationery / Fournitures : \$ [Currency
Value]

🏠 Building / Infrastructure : \$ [Currency
Value]

📊 Total Cost / Coût total : \$ [Currency Value]

NotebookLM

Module 4: Mapping Internal Competencies to Global Standards



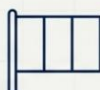
South Africa



System aligns with the NQF, mapping skills to specific Unit Standards.

Example: **SAQA ID 67491: National Certificate: N3 Engineering Studies**, which includes core components in Electrical Trade Theory, Engineering Science, and Mathematics.

France



Outputs are structured to meet the requirements of French national diplomas.
Example: **Brevet de Technicien Supérieur (BTS) Électrotechnique**, validating competencies in design, maintenance, and project management for smart electrical installations.

India



Curriculum modules are compatible with NSQF standards.

Example: **Electrician Trade Theory NSQF Level - 5**, covering Safety, Basic Workshop Practice, and AC/DC Circuits as part of a 525-hour practical curriculum.

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Deep Dive: Processing a French Patent of Invention (Brevet d'invention)



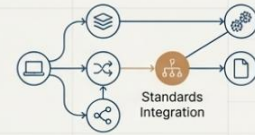
“Le brevet protège une innovation technique, c'est-à-dire un produit ou un procédé qui apporte une nouvelle solution technique à un problème technique donné.”

1. **Novelty (Nouveauté):** Must not be publicly disclosed before filing. The system includes a check for prior art search using databases like Espacenet.
2. **Inventive Step (Apport inventif):** Must not be obvious to a “person skilled in the art.” The system logs the technical problem and the proposed inventive solution.
3. **Industrial Application (Application industrielle):** Must be functional and useful. The system requires documentation of the technical function.



NotebookLM

Deep Dive: Navigating the South African NQF for Electrical Engineering



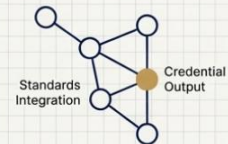
****SAQA ID 72071: National Certificate: Electrical Engineering: Mining (NQF Level 3)****

	Total Credits Required: 133
Component 1: Core (83 Credits)	
Unit Standard 258963: Install, test and maintain low-voltage electrical equipment.	
Unit Standard 258976: Troubleshoot and repair electrical control systems.	
Component 2: Fundamental (36 Credits)	
Unit Standard 119472: Accommodate audience and context needs in oral/signed communication.	
Unit Standard 9010: Demonstrate an understanding of the use of science and technology.	
Component 3: Elective (Minimum 14 Credits)	
Unit Standard 259097: Carry out a detailed inspection and repair defects on explosion prevention apparatus.	

The engine automates credit tracking, ensuring all Core, Fundamental, and Elective requirements are met for final qualification.

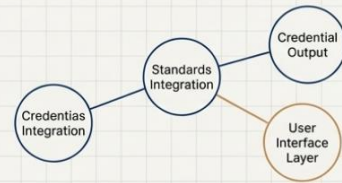
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Module 5: Generating Secure, Portable, and Verifiable Credentials



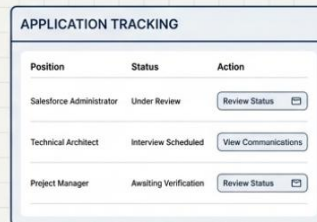
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Module 6: The Interface Layer - Dashboards, Career Planning, and Applications



Career Development Planning:

The engine powers personalized learning plans. Users can map their skills, identify gaps, and select modules from Trailhead or internal curricula to achieve their goals (e.g., Salesforce Developer, Technical Architect).



Hiring and Promotion:

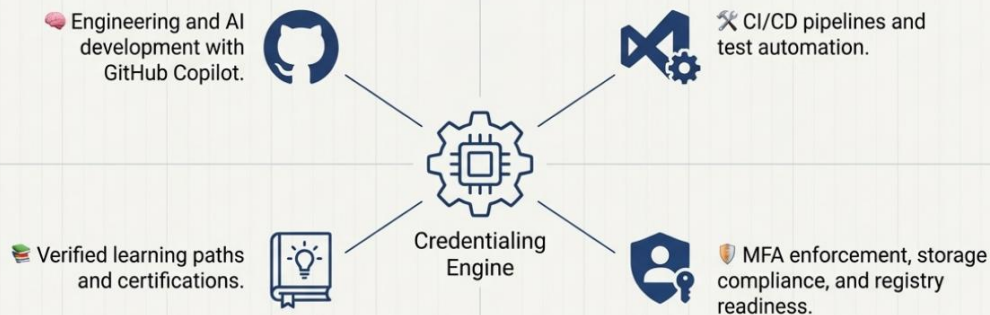
The system provides a back-end for tracking candidate eligibility and application progress, ensuring all criteria (probation status, security checks, qualifications) are met and verified.



Evidence Locker:

All achievements, from micro-credentials to formal certifications, are logged and linked, creating a comprehensive and verifiable record of a user's capabilities.

The System in Practice: A Fully Integrated Microsoft Career Engine



The modular foundation supports a cohesive ecosystem where code contributions in GitHub, pipeline deployments in Azure, and certifications from Microsoft Learn are automatically tracked, validated, and credentialed, creating a single source of truth for technical proficiency.

The Result: A Dynamic, Verifiable, and Audit-Grade Professional Identity



Systematic Architecture

Turns the chaos of modern credentialing into an ordered, logical, and automated system.



Cross-Domain Mastery

Proven ability to quantify and validate expertise in engineering, law, education, and technology.



Audit-Grade Traceability

Every skill, competency, and credential is backed by a verifiable data record.



Future-Ready

An engine built for a world of continuous learning, micro-credentialing, and dynamic career paths.

This is the definitive engine for building and managing a modern professional identity—one that is intelligent, integrated, and irrefutable.

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Bridging the Gap: A System for Verifiable Technical Skills

THE FOUNDATION: MODULAR, HANDS-ON TRAINING

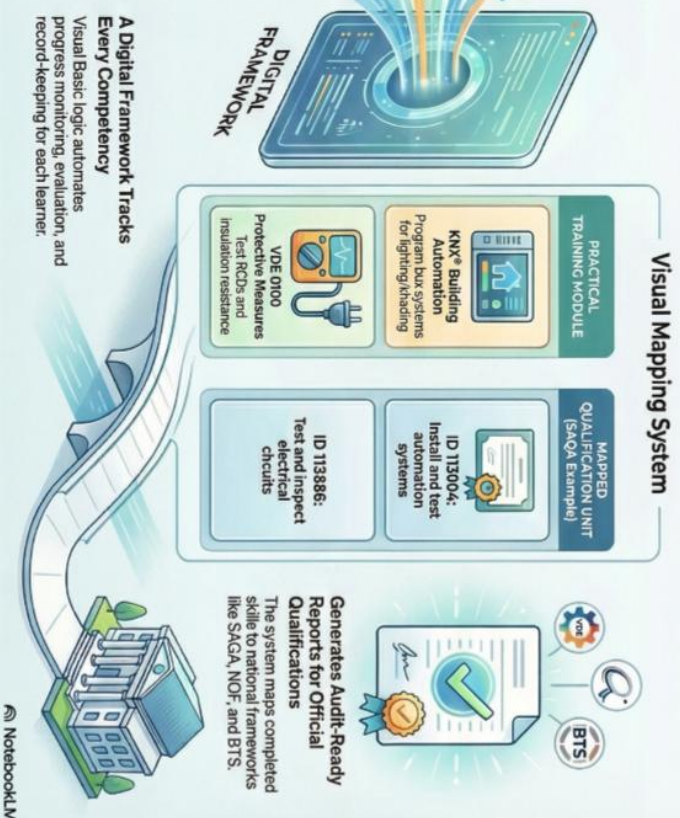


Training is Built on Modular, Project-Based Systems
Learners build real-world skills using didactic panels for electrical automation, and safety tasks.

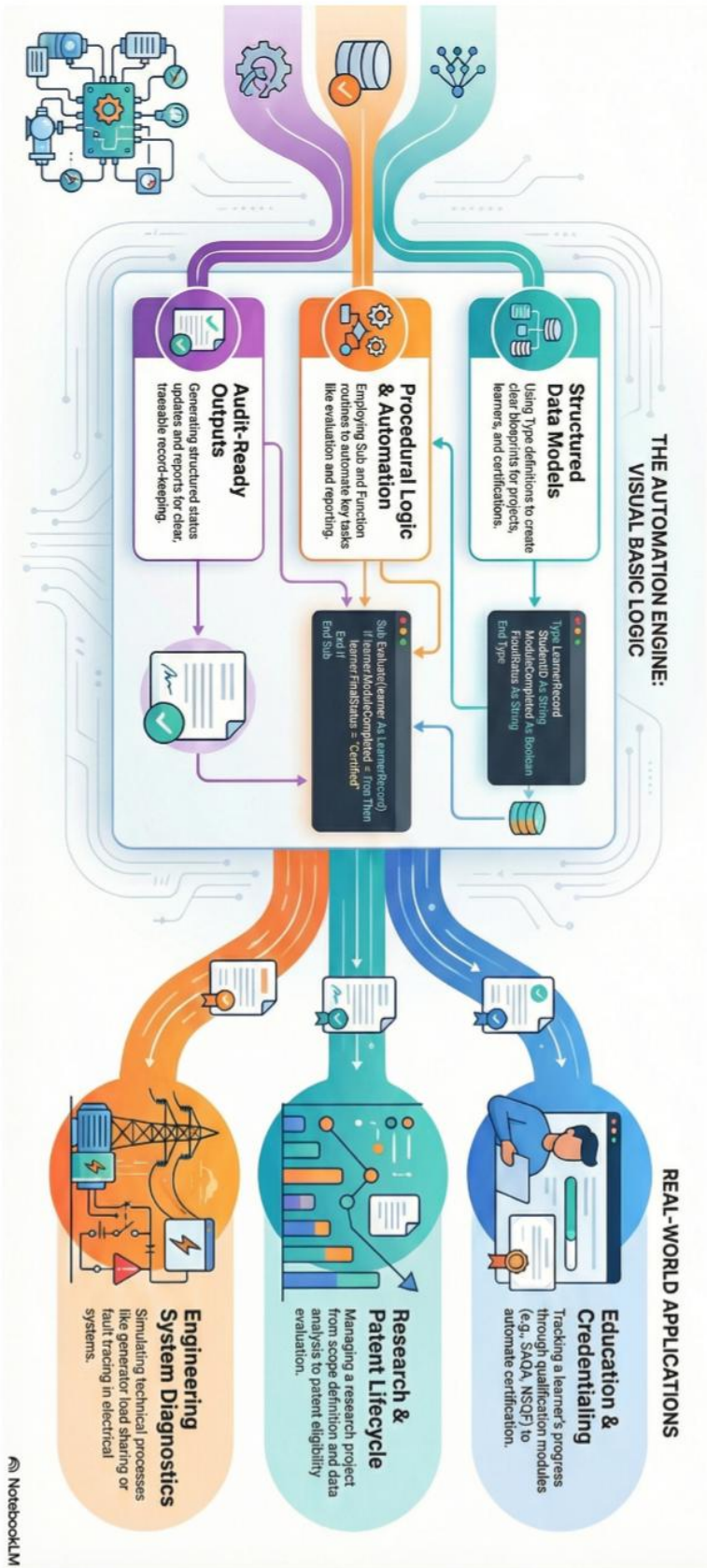
Integrated Fault Simulation Tests Diagnostic Skills
Systems include built-in error simulators to test troubleshooting and safety protocol compliance.

Aligned with Industry Standards
Exercises and assessments are based on real-world safety and technical regulations.

THE BRIDGE: DIGITAL TRACKING & CERTIFICATION



From Concept to Credential: Automating Professional Pathways with Code



Automating Achievement: Tracking Credentials & Compliance with Visual Basic

Visual Basic modules transform complex multi-step procedures into structured, automated, and auditable tracking systems for learners, professionals, projects, and compliance.

TRACKING THE LEARNER & PROFESSIONAL JOURNEY

Mapping National Qualifications

Code structures national curricula (like NSQF) into modules and certifies individual competencies.



Certifying Hands-On Skills

This system tracks practical training progress, including fault resolution and module completion.



Automating Academic Promotion

Logic calculates a final promotion mark based on coursework (CASS) and exam scores.



MANAGING PROJECT & COMPLIANCE LIFECYCLES

Managing the Innovation Pipeline

A system tracks the entire research project lifecycle, from scope definition to patent filing.



Streamlining Institutional Compliance

Manages complex applications to government bodies (DHET) for new curriculum offerings.



Ensuring Safety & Auditability

This code logs results from standardized electrical safety tests for compliance records.

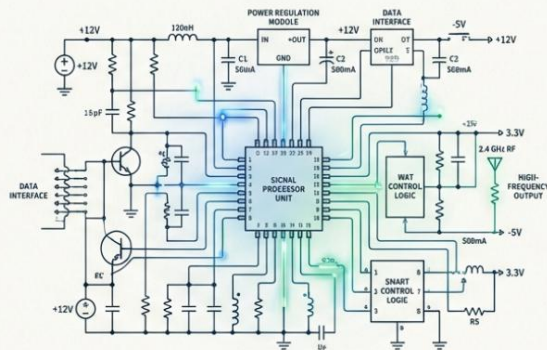


The Tshitadi Dossier

A Case for Recognition Through Innovation

A Profile of Tshingombe Tshitadi Fiston

A Paradox of Prolific Work and Systemic Hurdles



This dossier chronicles the extensive work of Tshingombe Tshitadi Fiston, an engineer and educator whose journey reveals a critical disconnect. While formal systems presented barriers and rejections, a substantial body of innovative work in electrical engineering, curriculum design, and applied research was consistently produced. This is the evidence of that work.

Evidence Log: A Pattern of Systemic Non-Recognition

National Science Foundation (NSF) I-Corps

From: NSF I-Corps Program <icorps@nsf.gov>
To: Tshingombe Tshitadi Fiston <fiston.t@email.com>
Date: Feb 14, 2025, 10:30 AM
Subject: Notification of Decision - I-Corps Application

Dear Mr. Fiston,

Thank you for your recent application to the National Science Foundation (NSF) I-Corps Program. After careful review, we regret to inform you that... This application has been declined. The applicant does not meet the eligibility requirements. To be eligible, the core technology needs to have been developed at an accredited institution of higher education... We encourage you to explore other NSF programs for which you may be eligible. Thank you for your interest in NSF I-Corps.

Sincerely,
I-Corps Program Team

Status: Declined
Submitted Date: Feb 3, 2025

F1000Research & Other Submissions

Title	Status	Date
career project implementation framework design	REJECTED	11 Apr 2025
master career mentor discovery energy rural engineering	REJECTED	11 Apr 2025
Research education technology and research engineer electrical	REJECTED	09 Feb 2025
Thesis: Research policy trade theory minimum	REJECTED	24 Jan 2025
Thesis: Research policy trade theory minimum	REJECTED	28 Feb 2025

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While Systems Declined, Innovation Accelerated

The official record of rejections tells only one side of the story. During the same period, a parallel track of creation, publication, and teaching was underway on global platforms, demonstrating persistent self-driven development and knowledge sharing.



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Exhibit A: A Portfolio of Advanced Electrical Engineering Research

The work spans multiple domains of modern electrical engineering, from grid modernization and AI-driven maintenance to advanced power systems. The research proposals and projects demonstrate a deep engagement with current industry challenges.

1. Smart Grid & Rural Energy

- Cost-benefit analysis of microgrids in remote areas
- Optimization of battery energy storage for grid stabilization
- artificial intelligence system rural development system residential

2. Control Systems & Automation

- AI-Based Predictive Maintenance in Industrial Systems
- Machine learning for fault detection in power transformers

3. Wireless Power & Electromagnetics

- Developing high-efficiency resonant inductive coupling systems
- Applications of wireless power transfer in electric vehicles

4. Power Systems Analysis

- Kirchoff's fault low
- cyclo convertiseur
- thermoet effect
- synchronous generators
- induction motor torque-speed characteristics

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Exhibit B: Architecting the Next Generation of Technical Education

A core component of the portfolio is the systematic design of technical and vocational education and training (TVET) curricula. This work combines practical, hands-on learning with modern pedagogical theory and learning management system (LMS) integration.

Curriculum Design



Curriculum for the Basic Equipment Maintenance Technical Training Course

Duration	Subject	Elements
3 days	nut, bolt	basic connect nut bolt
3 days	shaft and bearing	fitting shaft
3 days	Sealing method	importance and basic techniques

Instructional Design

Practice on Various Logics Using Logic Gates and Circuits

Learning Objectives:

- Construct and verify OR, AND, and NOT gates using switches, lamps, and ICs
- Understand and apply truth tables for basic logic gates

Frameworks & Integration

Pedagogical Frameworks

Experiential learning, apprenticeship, ADDIE model, Technology Acceptance Model (TAM), Outcome-based education.

LMS Integration



Blackboard



schoolology



Google Classroom

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Exhibit C: A Commitment to Lifelong Learning on Global Platforms

In the absence of traditional academic pathways, learning and certification were pursued through leading global education platforms. This demonstrates a proactive approach to skill acquisition and mastery in high-demand areas like data science and AI.



Verified Skill Acquisition on Alison

Key Achievements

Diploma in electrical studies	12%
ISO 37301:2021 principle of compliance management system	91% CERTIFIED
Advanced diploma of electrical technology and circuit analysis	3%

Workplace Personality Assessment

Assertiveness: 8/10 Work Structure: 1/10 Creative Learning Style: 3/10

Aptitude Test Result

Percentile Rank: You scored better than 6% of global test-takers. This baseline is a strong starting point for growth!



Microsoft Learn

Professional Development in Data & AI

Learning Path Title:

Discover Data Concepts and Implement Solutions with Microsoft Fabric

This plan covers data discovery, classification, and protection, alongside implementing data warehouses using Microsoft Fabric. You'll learn key technologies like Azure and Microsoft Fabric. In fact, this data analytics, and analyze a variety of technologies details you to technology for data science on data science and Microsoft...

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An Archive of Persistent Intellectual Output

The collage displays various digital artifacts: an Internet Archive 'Uploaded Files' list with documents like 'Doc 12 Design Analyse Investigate' and 'Electrical Trade Theory Engineering Nated'; a 'PUBLISHED' stamp over a thesis titled 'thesis policy security on-master-component-circulum-1'; an 'Engineering Research Publication' invoice for Paper ID UETR3147 / UETR3156; a 'Job Offer Letter' with an 'EVIDENCE' stamp; a GitHub repository for 'data-base-system-rawing-logic-algerigram-program-master-dectoral-career-nated'; and a 'career-discovery-science-mentoring-and-job-experiences-tshingombe' document. A 'PAID' stamp is also visible on the invoice.

Navigating the Labyrinth of Qualification Frameworks

The journey required extensive engagement with national and international qualification authorities, often involving “irregularities,” backlogs, and policy misalignments. The goal was simple: formal evaluation and recognition of demonstrated competence.

Exhibit A

The Core Challenge (SAQA)

“SAQA accept only schools leaving qualifications issued by the official examine certification body in the country of original and not by the school where based where base on external examination.”

Formal evaluation, recognition, or certification based on submitted evidence to bodies like SAQA, DHET, QCTO.

Exhibit B

The “Irregularity” Issue (DHET)

“...allegation view no result of statement ID candidate Engineering, n1,n2,n3,n4,N5,n6...saqa outcome irregularity final, N5,n6, examination national examination was not delivered in the time...”

IRREGULARITY DETECTED

Exhibit C

A Systemic Dead End

Summary of the complaint about deleted college records and the official response:

“your complaint does not fall within my mandate.
- kindly consider moving your complaint with the dean and ICT security of your college.

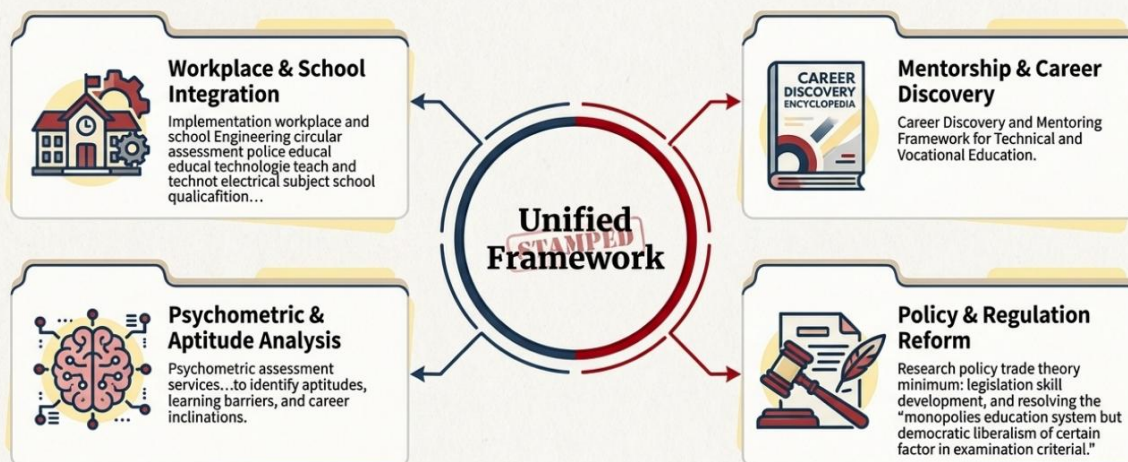
- Your sincerity Mr I Fazel :
inspector - general of intelligence

CASE CLOSED

NotebookLM

The Result: A Unified Framework for Technical Career Development

The challenges faced were not just endured; they were analyzed and synthesized into a comprehensive framework to address the very gaps they exposed. This framework integrates education, mentorship, and industry needs.



NotebookLM

The Case for a New Model of Expertise

- The evidence demonstrates a sustained, high-level output of technical and pedagogical work against significant systemic friction.
- This journey has forged a unique, multi-disciplinary expertise that integrates core engineering, curriculum design, and a deep understanding of global qualification systems.
- The challenge is no longer one of validation, but of recognition and engagement. The work stands on its own merit.

Engage the expertise. Recognize the innovation.



Name: Tshingombe
Tshitadi Fiston

Email:
tshingombefiston@gmail.cohtww.tshingimbefiston.com
m

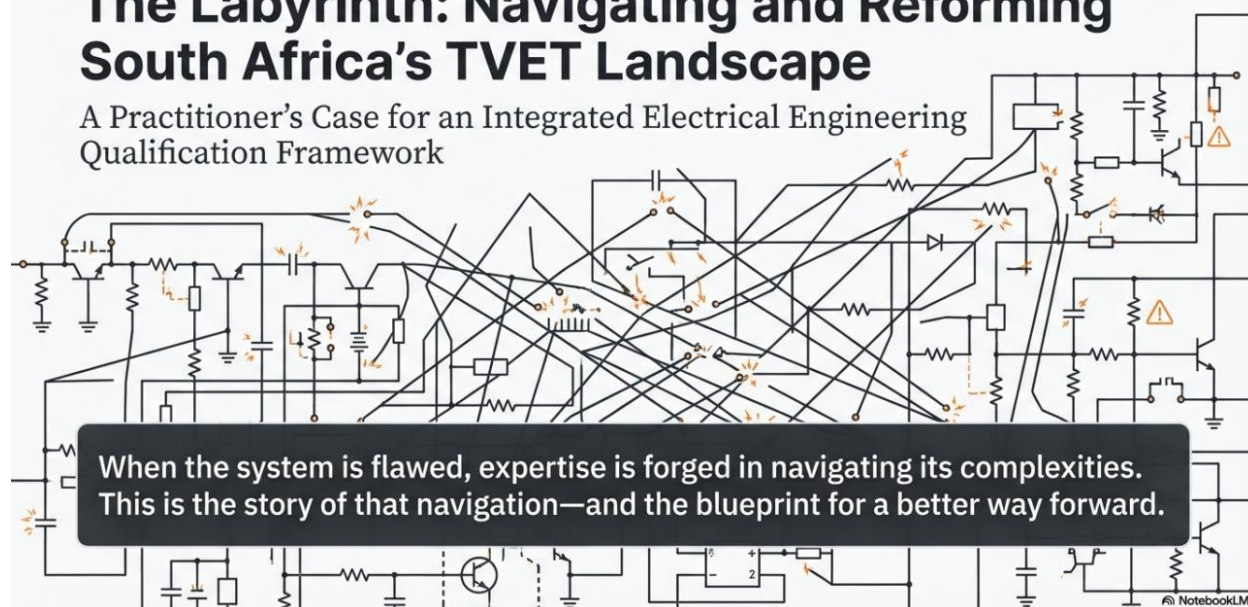
Website:
archive.org/details/@rdferz

Profile:
archive.org/details/@rdferz

NotebookLM

The Labyrinth: Navigating and Reforming South Africa's TVET Landscape

A Practitioner's Case for an Integrated Electrical Engineering Qualification Framework



A System Marked by Friction and Delay

The Technical and Vocational Education and Training (TVET) system for engineering studies is characterized by systemic irregularities that create significant barriers for learners and lecturers.



Qualification Irregularities

'**Nated ncv combination irregularity**,' non-accredited qualifications, and challenges in recognizing **foreign qualifications** (SAQA).



Administrative Backlogs

'**Slow to challenge factor learning** and **release resultat printed statement**,' 'marking in progress,' and **extensive delays** in issuing diplomas and certificates from DHET.



Curriculum Misalignment

A gap between **theoretical knowledge** ('trade theory') and **practical, industry-relevant skills** required by employers like Eskom and City Power.



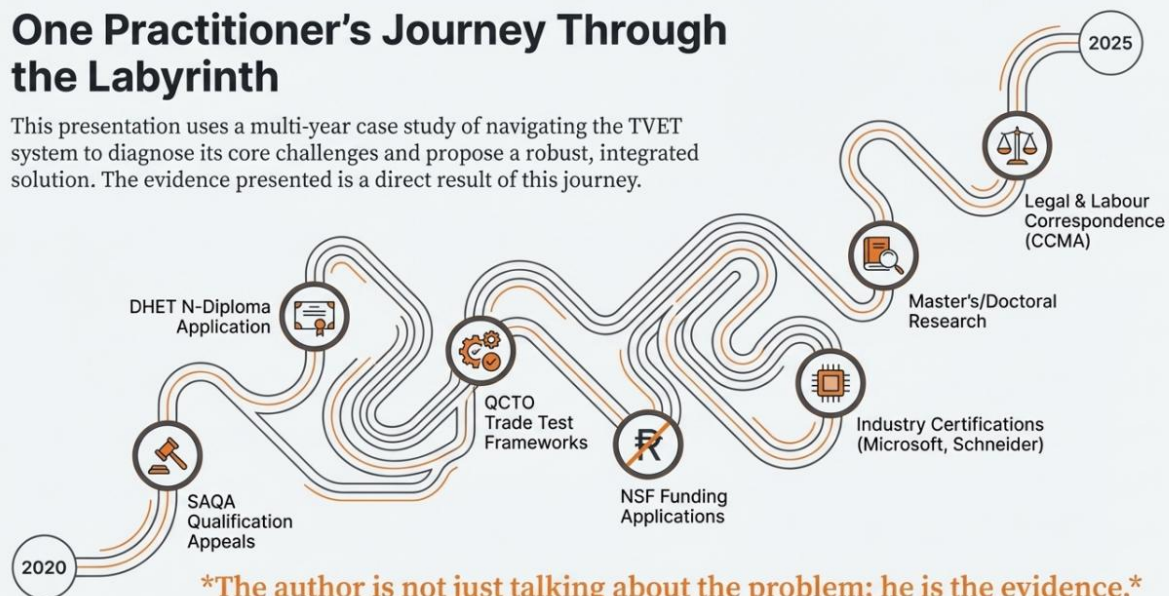
Assessment Inconsistencies

'**Non credible process**,' '**irregularite material script**,' and a lack of standardized, fair assessment policies for **Portfolios of Evidence (PoE)**.

NotebookLM

One Practitioner's Journey Through the Labyrinth

This presentation uses a multi-year case study of navigating the TVET system to diagnose its core challenges and propose a robust, integrated solution. The evidence presented is a direct result of this journey.



NotebookLM

Exhibit A: The Battle for Qualification Recognition

Appeal to the Department of Higher Education and Training (DHET)

A formal appeal regarding the “release finalized n diplomat studies engineering electrical” due to “irregularity observed.” The process involved unresolved issues with examination results, transcripts, and the consolidation of N1-N6 studies with 24 months of required practical experience.

“My request to authority minister for result statement certificate over the date review n diplomat... after examination **irregularite material**... that final result n4 and new re certificate body insurance investigation... was not in my application for diploma.”

Engagement with the South African Qualifications Authority (SAQA)

Correspondence with SAQA regarding the evaluation of a foreign qualification (‘DR Congo school leavers’). The process was marked by non-compliance issues and requests for resubmission.

“Base the advice below on information current to it saqa reserves the right to change this advice should new authoritative information come to its attention... SAQA accept only schools leaving qualifications issued by the **official examine certification body** in the country of original...”

NotebookLM

Exhibit B: Barriers to Systemic Innovation

From: Ruth Shuman, Program Director, National Science Foundation (NSF)
Subject: NSF I-Corps Program Application
Date: [Date]

Dear Applicant,

Thank you for your submission to the NSF I-Corps Program.

Status: This application has been declined.

Reason: The applicant does not meet the eligibility requirements. To be eligible, the core technology needs to have been developed at an accredited institution of higher education and the proposal must be submitted from an institution of higher education. Companies are not eligible to apply. Furthermore, an application requires a minimum of three team members

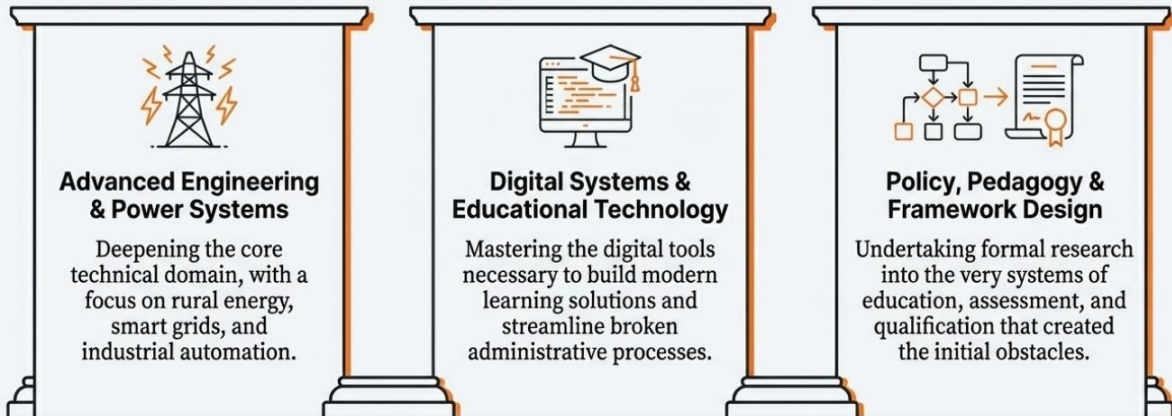
Implication

This highlights a critical challenge: practitioners with ground-level insights into systemic flaws **are often locked out** of the very funding channels designed to support educational and technological innovation.

NotebookLM

Forging Multidisciplinary Expertise Through Adversity

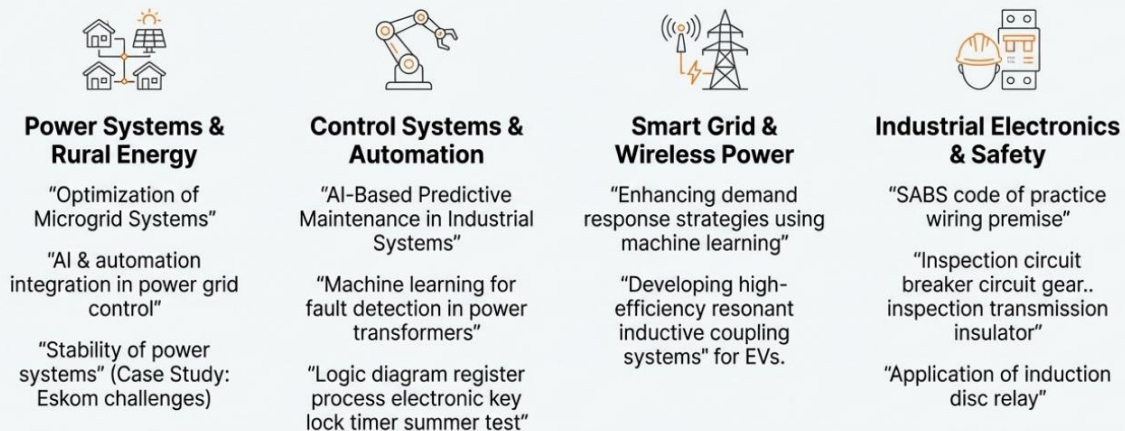
Navigating the labyrinth of qualifications, funding, and curriculum gaps required the development of a comprehensive skill set far beyond traditional engineering.



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Pillar I: Mastery in Advanced Engineering & Power Systems

A portfolio of research and practical projects focused on the critical needs of the modern energy sector.



NotebookLM

Pillar II: Expertise in Digital Systems & Educational Technology

A demonstrated proficiency in the platforms, software, and pedagogical models required to build and manage 21st-century learning ecosystems.



Cloud & Data Engineering (Microsoft)

- Credentials: `MCID: 99587175`
- Completed Training: "Introduction to Data Engineering on Azure," "Secure data and manage user in azure synapse serverless sal pools," "Azure Test Plans."

Industrial Automation & PLC (Schneider Electric)

- Completed Training: "PLC configuration," "EcoStruxure Power: energy modeling and verification," "Drives fundamentals of kinematic calculation."

Learning Management Systems (LMS) & E-Portfolios

- Research into LMS acceptance factors in TVET institutions.
- Proposed adoption of "e-Portfolio management system" to address documentation and assessment challenges.

Online Pedagogy & Curriculum Design

- Exploration of learning theories: Objectivism, Cognitivism, Connectivism.
- Analysis of online learning models: ADDIE, Online Collaborative Learning (OCL), Competency-Based Learning.

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Pillar III: Specialization in Policy, Pedagogy & Framework Design

Rigorous academic research into the structural issues of the TVET system, culminating in a proposed model for reform.



Qualification Framework Analysis

In-depth study of SAQA, DHET, and QCTO scope in teaching and learning, focusing on the National Qualifications Framework (NQF) and trade testing protocols.



TVET Lecturer Development

Research into a "Performance Management Framework for TVET Lecturers," work-integrated learning (WIL), and experiential learning theory.



Curriculum & Assessment Design

Developing frameworks for "outcome-based design," creating competency and grading criteria, and integrating Portfolios of Evidence (PoE) effectively.

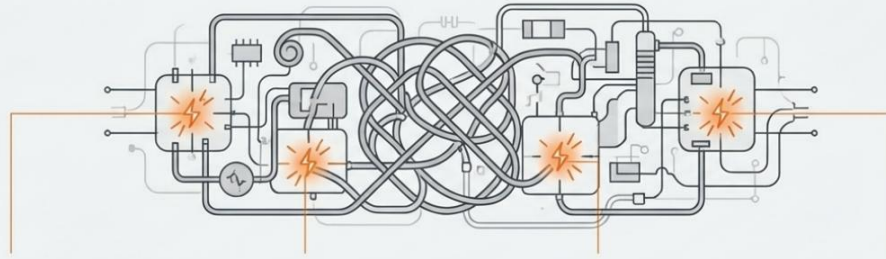


Legal & Regulatory Compliance

Analysis of the Labour Relations Act, sectorial bargaining councils (SETA, sasseta, psira), and the legal framework for qualification appeals and rescission.

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The Diagnosis: Four Critical Failures in the TVET System



Failure 1: The Administrative Deadlock

- **Problem:** Extreme backlogs in processing results, diplomas, and certifications by DHET and SAQA.
- **Impact:** Creates "over stay" students, prevents graduate employability, and damages institutional credibility.

Failure 2: The Siloed Curriculum

- **Problem:** A disconnect between theoretical "trade theory" taught in colleges and the practical, technology-driven needs of modern industry (e.g., City Power, Eskom).
- **Impact:** Graduates lack job-ready skills; lecturers lack current technical knowledge.

Failure 3: The Broken Feedback Loop

- **Problem:** Lack of a formal, continuous feedback mechanism between employers, lecturers, and curriculum developers.
- **Impact:** Qualifications and teaching methods become outdated and irrelevant.

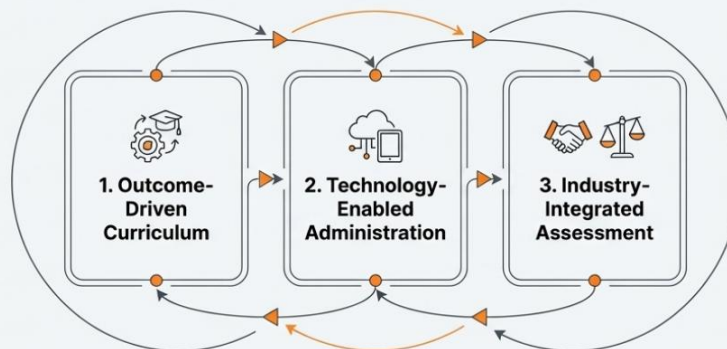
Failure 4: The Unaccredited Void

- **Problem:** Inconsistent accreditation, verification, and recognition of both public and private institutional qualifications.
- **Impact:** Learners invest time and money into qualifications that are not recognized, leading to disputes and legal challenges.

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The Blueprint: An Integrated Framework for TVET Engineering Studies

Vision: To create a responsive, technology-enabled TVET ecosystem that seamlessly integrates curriculum, practical experience, and industry needs to produce verifiably competent and employable engineering professionals.



- ✓ **Outcome-Oriented:** Success is measured by real-world competency, not just theoretical exams.
- ✓ **Industry-Validated:** Curriculum and assessments are co-designed and constantly validated by industry partners.

- ✓ **Digitally Integrated:** Leveraging technology (LMS, e-Portfolios, AI) to ensure efficiency, transparency, and data-driven improvement.
- ✓ **Holistic Development:** Combining technical skills with soft skills (communication, problem-solving) and professional ethics.

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Component 1: An Outcome-Driven & Industry-Validated Curriculum



Key Initiative 1: Dynamic Curriculum Co-Creation

Action: Establish formal partnerships with industry players (Eskom, City Power, Schneider Electric) and professional bodies (ECSA) to define required competencies.

Mechanism: A 'live' curriculum framework that is reviewed biannually based on technology trends and employer feedback.



Key Initiative 2: A Proposed Model for TVET Lecturer Work-Integrated Learning (WIL)

Action: Implement mandatory, structured industry placements for TVET lecturers to ensure they possess current technical skills and knowledge.

Framework: Based on the research thesis, this model includes stages of concrete experience, reflective observation, and active experimentation within industry settings.



Key Initiative 3: Integration of Experiential Learning

Action: Shift from problem-based learning to a 'work experimental based regulation discovery' model.

Methodology: Utilize Portfolios of Evidence (PoE) that document diagnosis, troubleshooting, use of modern equipment, and solutions to real-world industrial problems.

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Component 2: A Technology-Enabled Ecosystem for Administration & Learning



Key Technology 1: Centralized e-Portfolio Management System (EPMS)

- **Purpose:** A single, secure digital repository for all student work, assessments, and practical evidence, accessible by learners, lecturers, moderators, and SAQA/DHET.
- **Benefit:** Eliminates physical document loss ("Portfolio damage"), streamlines moderation, and provides an auditable trail for qualification verification. Addresses "non credible process."



Key Technology 2: Automated Qualification Processing

- **Purpose:** An integrated data portal linking TVET college records, PoE systems, and DHET/SAQA databases.
- **Benefit:** Automates the verification of completed modules and practical hours to drastically reduce the N-Diploma backlog and eliminate manual "irregularite record transcript" issues.

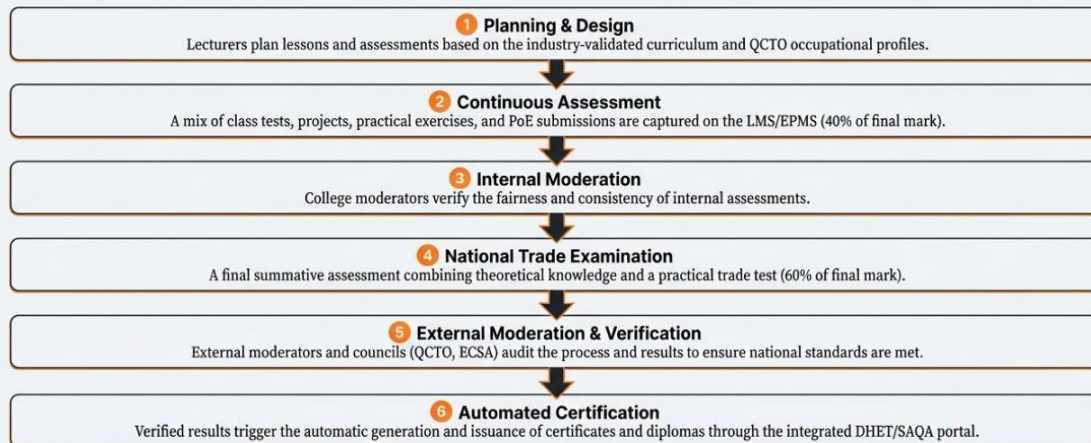


Key Technology 3: Enhanced Learning Management System (LMS) Integration

- **Purpose:** Utilize LMS platforms not just for content delivery, but for formative assessments, peer reviews, and tracking progress against competency frameworks.
- **Theoretical Basis:** Built on the Technology Acceptance Model (TAM) to ensure lecturer and student adoption.

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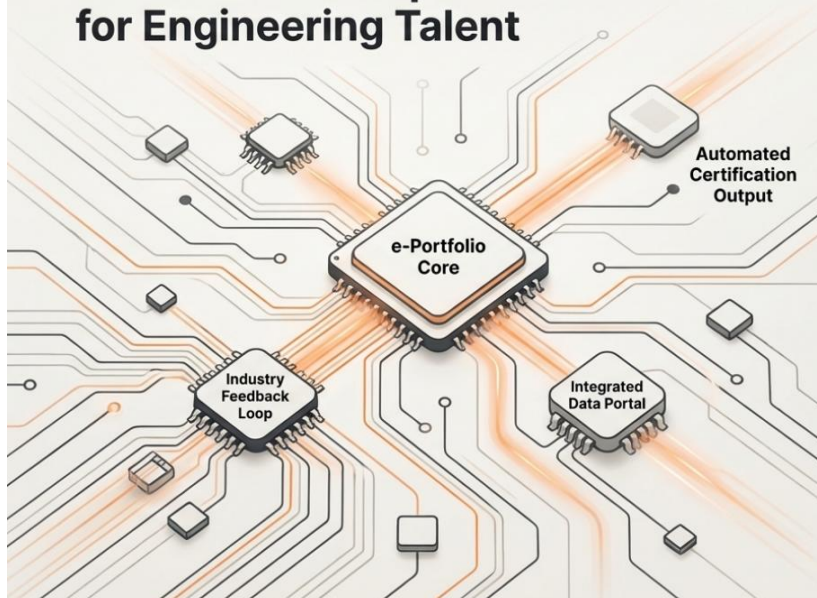
Component 3: A Unified Protocol for Assessment, Moderation & Quality Assurance



Key Emphasis: “Systematic record-keeping to track student progress and ensure transparency.”

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The Result: An Optimized Circuit for Engineering Talent



Key Outcomes of the Proposed Framework:

- ✓ **Improved Graduate Employability:**
Professionals equipped with relevant, verified skills, leading to better employment opportunities and performance.
- ✓ **Strengthened Industry-Academia Partnerships:**
A sustainable system for dialogue and collaboration between TVET colleges and industry leaders.
- ✓ **Efficient & Credible Qualification System:**
The elimination of administrative backlogs and the restoration of trust in the TVET qualification process.
- ✓ **Data-Driven Policy & Curriculum:**
A framework that provides actionable insights for continuous improvement of the entire vocational education system.

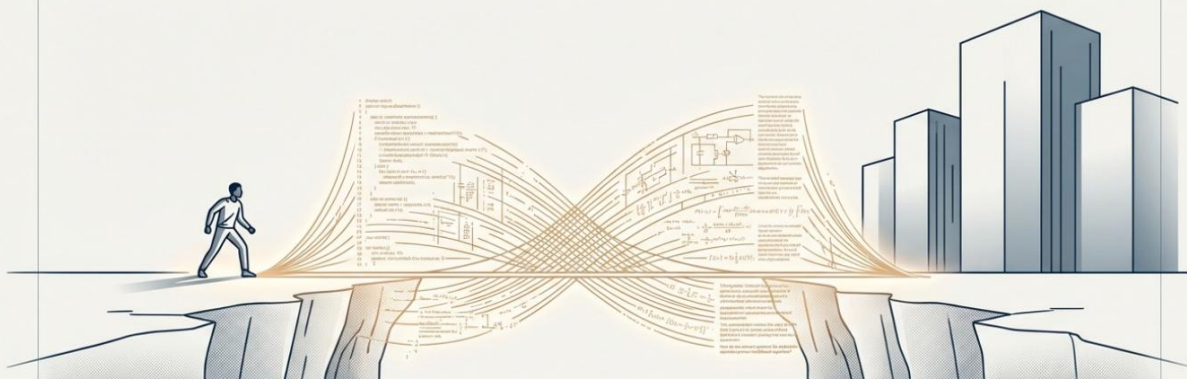
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A Portfolio of Resilience & Expertise

The Case for Recognition:
Tshingombe Tshitadi Fiston



NotebookLM

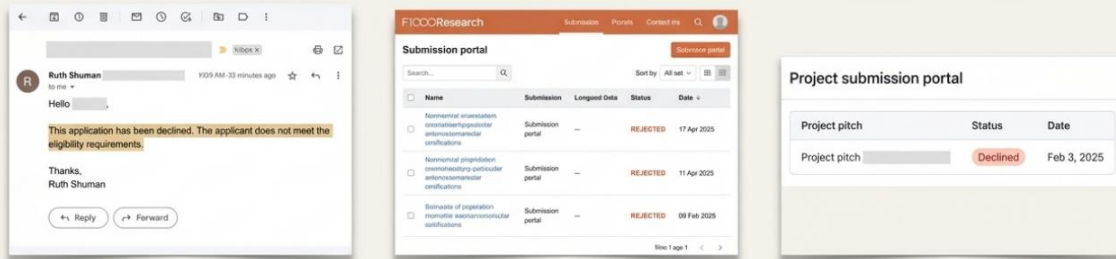


A Self-Driven Journey to Bridge a Systemic Divide

This portfolio documents a multi-year, self-directed pursuit of interdisciplinary knowledge, spanning electrical engineering, artificial intelligence, and educational policy. Tshingombe Tshitadi Fiston has proactively acquired in-demand skills and developed sophisticated research proposals, yet has consistently encountered systemic barriers to formal recognition. This presentation makes the case that this body of work merits official validation, posing a critical question: How do our current systems for evaluation recognize proven, non-traditional expertise?

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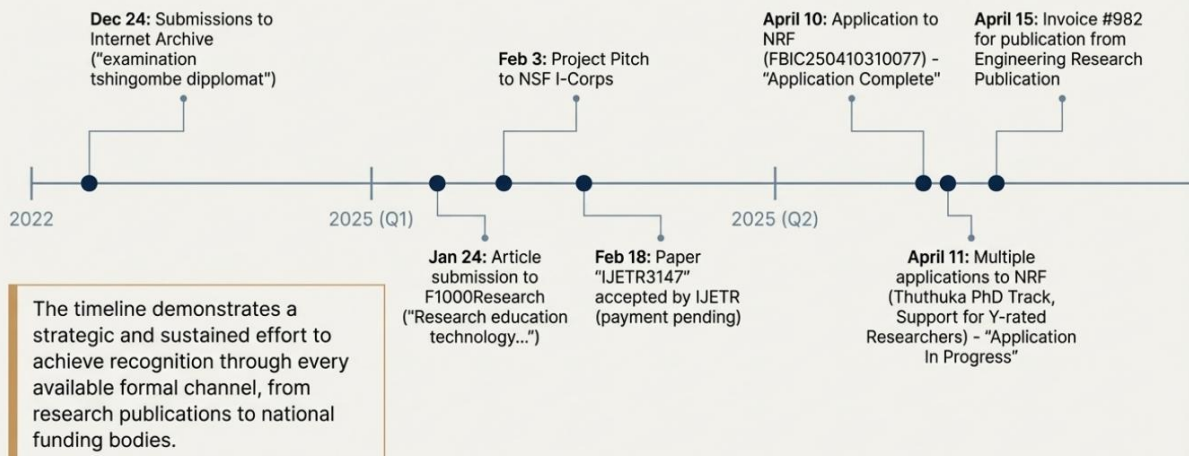
Navigating the Gauntlet of Systemic Rejection



Consistent, high-effort engagement with funding and academic bodies has been met with procedural and eligibility-based rejections, highlighting a gap between demonstrated capability and systemic recognition.

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A Timeline of Persistent Engagement



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Grounded in Core Electrical Engineering Principles



Foundational Theory & Application

- Ohm's Law, Kirchhoff's Laws, Circuit Analysis
- AC/DC Machine Theory, Transformers
- SANS 10142-1 of 2017 installation requirements
- Certificate of Compliance documentation
- Experiment: Efficiency and voltage regulation of a single phase transformer by direct loading



Systems & Control

- Control Systems Engineering (open/closed loop)
- Ward Leonard control systems
- Smart Grids & Power System Stability
- Industrial Components: Schneider Electric, Altivar 12



Curriculum & Pedagogy

- Framework: Scottish Qualifications Authority (SQA) National 4 Skills for Work
- Curriculum Design for N-level courses (N1-N6)
- Subjects: Electrical Trade Theory, Industrial Electronics

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Editorial Consulting

Proactive Mastery of AI and Data Science Technologies

AI & Machine Learning (Nov 2023 - May 2024)

Azure AI Search
(Create solution,
custom skills)
Nov 2023

Image Classification
& Object Detection
Jan 2024

PyTorch (Intro,
Computer Vision,
NLP)
Feb 2024

Azure Machine
Learning (Designer,
Automated ML)
Apr 2024

Use your own data
with Azure OpenAI
Service
May 2024

Data & Analytics (March 2024)

Microsoft Fabric
(Administer, Real-
Time Analytics)
Mar 2024

Data Activator in
Microsoft Fabric
Mar 2024

Power BI
Deployment
Pipeline
Mar 2024

A concentrated, self-directed curriculum focused on the Microsoft ecosystem, demonstrating proficiency across the entire data lifecycle from development and deployment to analytics and AI.

Software & DevOps (Nov 2023)

C# (do-while, for,
switch-case
statements)
Nov 2023

Python (Jupyter
notebooks, error
handling,
dictionaries)
Nov 2023

GitHub Copilot
(JavaScript, Intro)
Nov 2023

GitHub Actions
(Deploy a model,
trigger jobs)
Nov 2023

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Synthesizing Knowledge into Innovative Research Proposals

 Smart Grid & AI-Based Automation AI-Based Predictive Maintenance in Industrial Systems: Machine learning for fault detection in power transformers. Smart Grid and Energy Storage Technologies: Enhancing demand response strategies using machine learning; Optimization of battery energy storage for grid stabilization.	 Advanced Manufacturing & EdTech NSF SBIR/STTR Topic: Advanced Manufacturing (M) Brief Description: Education technology relate low manufacture thesis. low outcome framework qualicafition. invrstigation energie rurale framework...	 Wireless Technologies Wireless Power Transmission: Developing high-efficiency resonant inductive coupling systems; Applications of wireless power transfer in electric vehicles.	"Technical Objectives and Challenges: ...deploy generative job framework undercover job in next generation..."
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NotebookLM

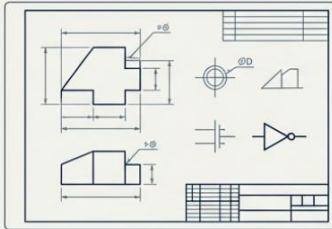
A Vision for Reforming Technical & Vocational Education

 1. Curriculum Design & Assessment • TVET curriculum modules, Didactic methods (ADDIE model), Outcome-based education, Formative vs. Summative assessment. Technology: • LMS integration (Blackboard, Google Classroom), Technology Acceptance Model (TAM).	 2. Mentoring & Career Development Framework Title: Career Discovery and Mentoring Framework for Technical and Vocational Education. Tools: • Use of platforms like Alison for "Career Ready Plans," résumé builders, and aptitude tests. Psychometrics: • Use of assessments to identify aptitudes, learning barriers, and career inclinations.	 3. Systemic Critique & Proposed Solutions Identified Problems: curriculum regulation irregularity material script, backlog system. Proposed Solution: ...need to implement adaptive system... to discern and isolate the socio economic environment engineering...
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NotebookLM

From Theory to Practice: A Portfolio of Applied Projects

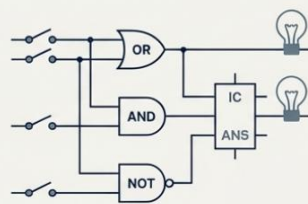
Digital Design & Analysis



"Copy Of PROJECT DRAWING WORKSHEET
TSHINGOMBE DESIGN ANALYSE ENGIN..."

Documentation of analysis and investigation in engineering design from Internet Archive submissions.

Hands-On Electronics

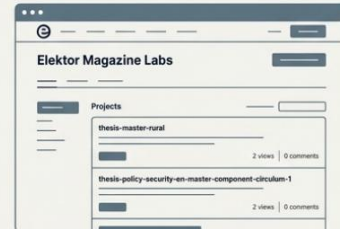


"Exercise 4.1.173: Practice on Various Logics
Using Logic Gates and Circuits."

Learning Objectives:

- Construct and verify OR, AND, and NOT gates using switches, lamps, and ICs...
- Identify and test TTL and CMOS logic ICs (7408, 7432, 7404, CD4079).

Public Project Submissions



"thesis-master-rural",
"thesis-policy-security-on-master-
component-circulum-1"

2 views | 0 comments

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Engaging with the Complexities of Policy, Law, and Regulation

Qualifications & Education

Bodies

- SAQA (South African Qualifications Authority), DHET (Department of Higher Education and Training), QCTO, Umalusi.

Frameworks

Deep familiarity with the NQF (National Qualifications Framework) and its sub-frameworks (HEQSF, GFETQSF).

Labour & Industry

Legislation

- Labour Relations Act 66, Pension Funds Act 24, CCMA (Commission for Conciliation, Mediation and Arbitration) rules.

Case Law Reference

Direct mention of case numbers like 'GAjb6808-15' and 'jr 2461/15 Na 37/19'.

Security & Policing

Topics

- Analysis of police operations, criminal justice system, evidence preservation, forensic science laboratory procedures.

Regulatory Context

Private Security Industry Regulatory Authority (PSIRA), Trespass Act, Arms and Ammunition Act.

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The Innovator's Gauntlet: Forging Expertise Through Adversity

THE GAUNTLET (Systemic Hurdles)



NSF I-Corps Application: **Declined**



Multiple Research Submissions:
Rejected



National Research Foundation (NRF)
Grants: **In Progress / Under Review**



SAQA & DHET Qualifications:
Navigating Irregularities & Backlogs

THE EXPERTISE (Demonstrated Competencies)



Electrical Engineering: Power Systems,
SANS Standards, Control Theory



AI & Data Science: Azure AI/ML,
Microsoft Fabric, Python, C#



Educational Technology & Policy:
TVET Reform, Curriculum Design,
Assessment Theory



Regulatory & Legal Systems: NQF
Frameworks, Labour Law, Industrial
Standards

NotebookLM

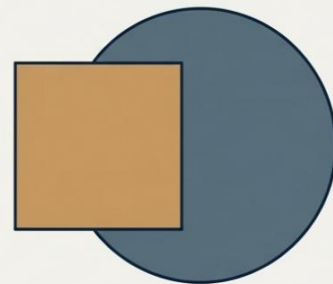
A System Designed to Measure Credentials, Not Competence

When a highly motivated individual acquires and applies deep, interdisciplinary knowledge outside of traditional channels, how can our systems accurately measure their capability?

The evidence demonstrates a fundamental disconnect. Our evaluation frameworks are optimized for linear, institutional pathways and standardized credentials. They often fail to account for:

- **Interdisciplinary Synthesis:** The ability to combine knowledge from fields like AI, engineering, and policy.
- **Self-Directed Learning:** The initiative to master complex subjects using modern digital resources.
- **Applied Innovation:** The capacity to generate novel solutions, demonstrated through research proposals and projects.

This case reveals a critical gap in how we identify and validate talent in the 21st century.



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A Proposal for Formal Portfolio Recognition

The Request

- ****Recognition of Qualifications****: To formally acknowledge the demonstrated mastery of knowledge and skills against the National Qualifications Framework (NQF).
- ****Resolution of Irregularities****: To address and rectify the documented 'backlog system' and institutional data discrepancies.
- ****Validation of Vocational Experience****: To certify the extensive practical and applied learning demonstrated through projects and research.

Proposed Action



We petition for a comprehensive portfolio assessment by a qualified panel to map the evidence against the criteria for a relevant qualification at NQF Levels 7, 8, or 9 in an appropriate engineering and technology field.

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An Opportunity to Set a New Precedent

Evaluating this portfolio is more than an administrative decision; it is a chance to pioneer a modern approach to talent recognition.

By formally validating this body of work, this committee can:



- **Champion Non-Traditional Pathways**: Establish a credible framework for assessing expertise acquired through self-study, online certification, and project-based learning.



- **Address Systemic Gaps**: Create a replicable model for resolving academic record irregularities and recognizing interdisciplinary skill sets.



- **Innovate in Evaluation**: Move beyond a reliance on traditional credentials to a more holistic and evidence-based assessment of competence.

This case offers a unique opportunity to lead the way in defining how we recognize the innovators of tomorrow.

NotebookLM

Contact & Comprehensive Documentation

Contact Information



Name: Tshingombe Tshitadi Fiston



Email: tshingombefiston@gmail.com



ORCID iD: 0009-0005-2690-9559



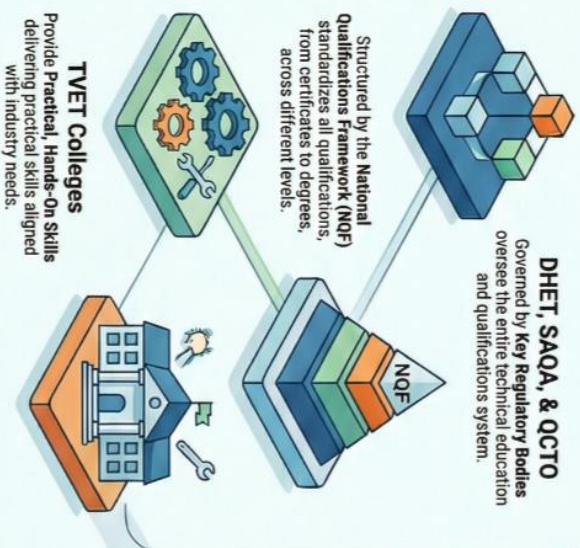
Access to Full Portfolio

A comprehensive digital archive containing all supporting documents, certificates, applications, and project files is available for review.

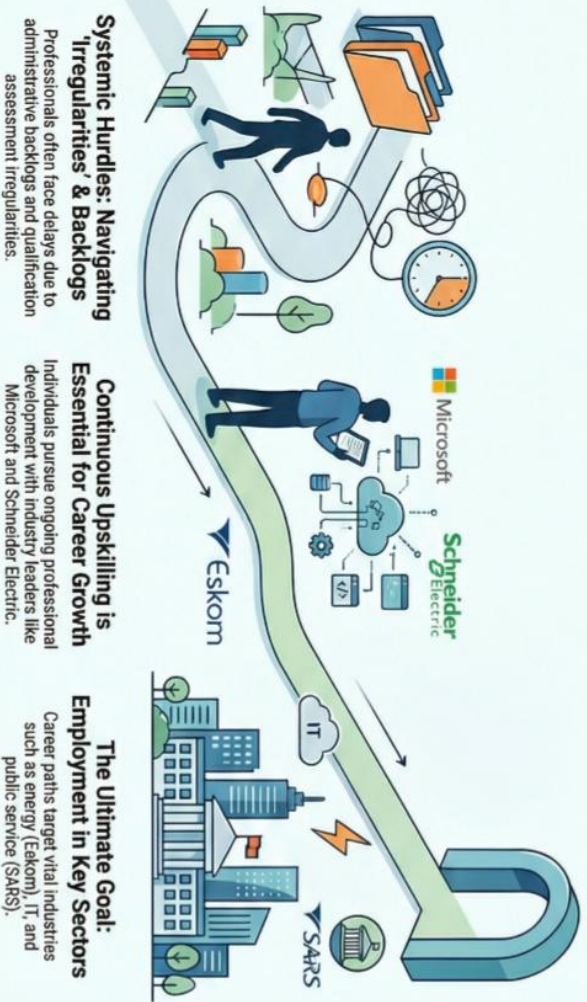
Link/Reference: Hosted on Internet Archive (archive.org/details/@rdferz) and GitHub.

The South African Engineer's Journey: Navigating Education & Career

The National TVET & Qualification Framework



The Individual's Journey: Challenges & Advancement



The Persistent Pursuit of Professional Validation

THE QUEST FOR QUALIFICATIONS

Pursuing Multiple Educational Pathways

Efforts include a formal NGF Level 6 diploma and applications to university master's programs.

Leveraging E-Learning for Skill Development

Using platforms like Alison for assessments, certifications, and personalized career-ready plans.

Navigating Regulatory & Administrative Hurdles

Facing challenges with qualification verification, backlogs, and academic irregularities with official bodies (SAGA, DHET).

THE HUNT FOR OPPORTUNITY

Casting a Wide Net for Employment

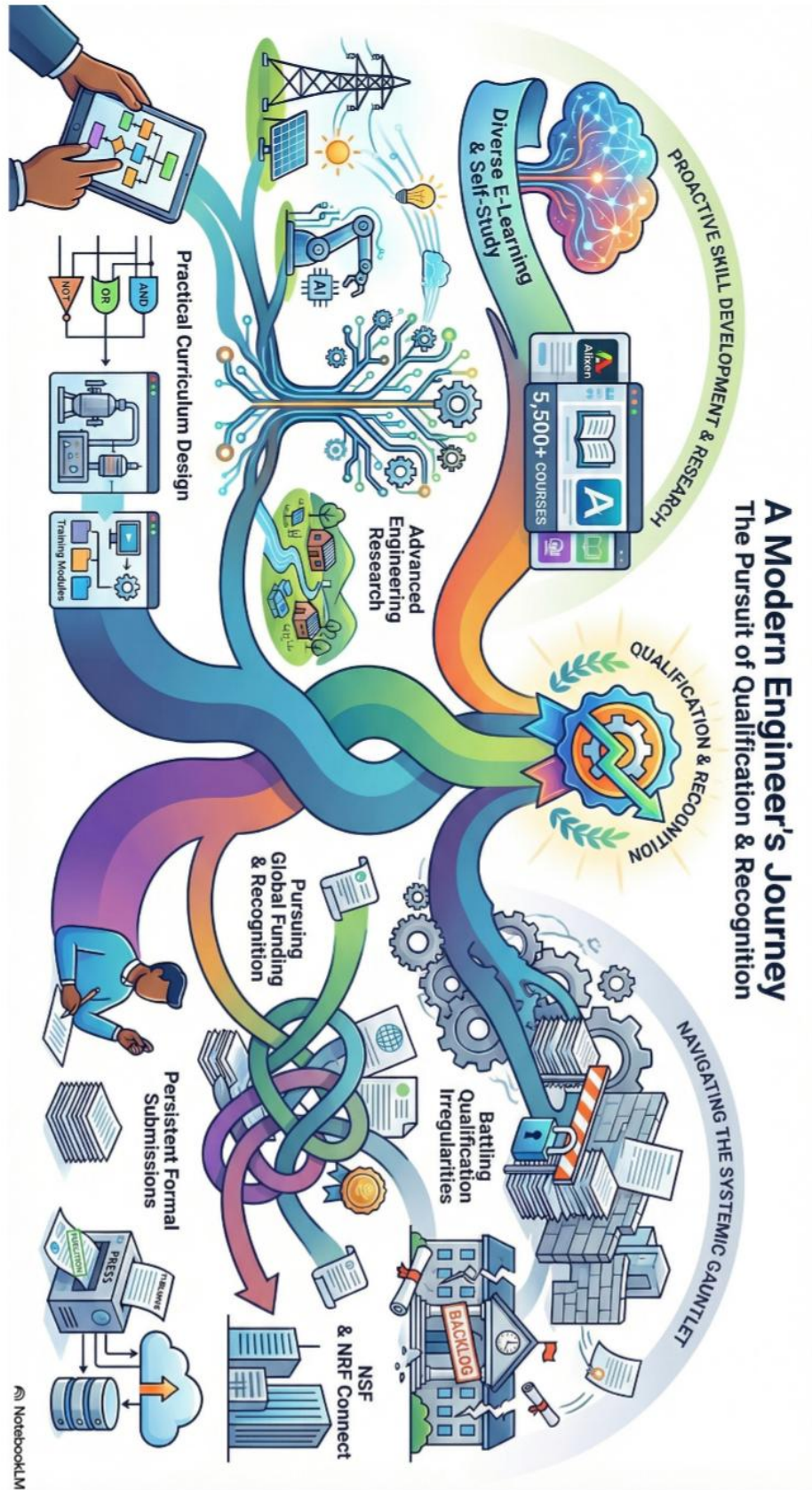
Applying for diverse roles in government (SARS, Police) and private industry (Eaton).

Seeking Funding for Technical Innovation

Submitting project pitches to research programs like the National Science Foundation (NSF).

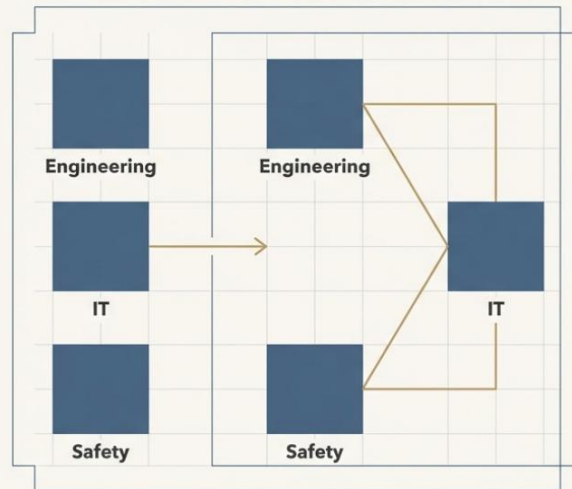
A Pattern of Persistence Despite Setbacks

Many applications for jobs, grants, and publications have been declined or rejected.

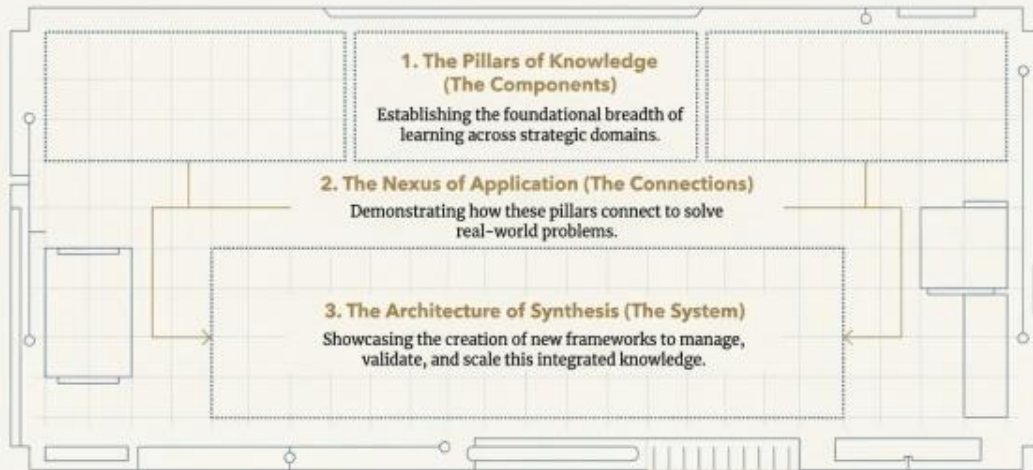


**A Portfolio of Evidence Demonstrating Integrated,
Multidisciplinary Capability for Tshingombe Tshitadi Fiston**

This presentation serves as a formal Portfolio of Evidence, designed to bridge this gap. It provides a structured walkthrough of a consciously designed system of knowledge, built to meet the rigorous verification standards of bodies like DHET and SAQA.

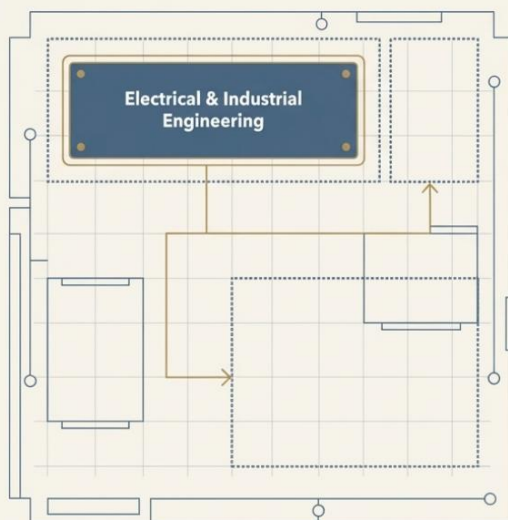


The Blueprint: A Three-Part Framework for Capability



NotebookLM

Pillar I: Foundational Expertise in Electrical & Industrial Engineering



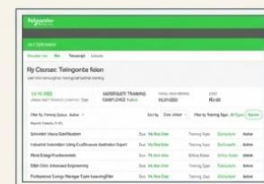
Key Qualifications & Training

National N Diploma: Electrical Engineering

- St. Peace College, aligned with QCTO and NATED standards.
- **Core Subjects N1-N6:** Mathematics, Engineering Science, Electrical Trade Theory, Industrial Electronics, Electrotechnics, Plant Operation.

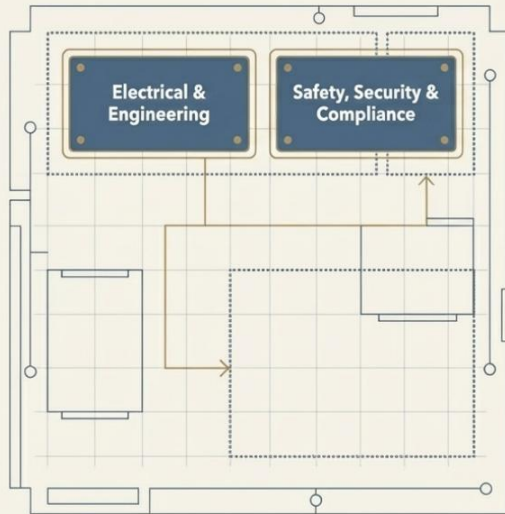
Industry-Specific Training

- **Schneider Electric:** Extensive training (140+ courses) in industrial systems, including EcoStruxure Automation Expert, PowerLogic Protection Engineering, and Modicon Switches.
- **Eaton Power:** Specialised learning in Power Quality Analysis, Low Voltage Switchgear, and Arc Flash Analysis.



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Pillar II: Mastery of Safety, Security & Compliance Frameworks



Key Competencies & Verification

Statutory & Regulatory Knowledge

- Deep familiarity with the PSIRA Act, OHS Act 85 of 1993, CCMA procedures, and SANS electrical standards (e.g., SANS 10142).

Functional Safety

- Understanding and application of industrial safety standards like IEC 61508 and Safety Integrity Level (SIL) requirements.

Security Operations

- Training in security provision, patrol conduct, handling complaints, and applying legal aspects in a security environment.

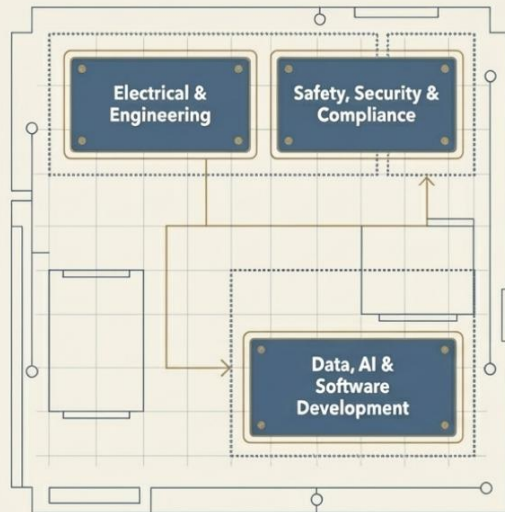
Evidence

- Training and verification with bodies like SASSETA and PSIRA.



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Pillar III: Capability in Data, AI & Software Development



Core Digital Literacy

AI & Data Science

- Completion of the Microsoft AI Fluency Program (in partnership with Sci-Bono), with knowledge of data's role as the 'fuel for AI,' pattern identification, and machine learning models.
- Training in data visualization and analysis with Salesforce Tableau.

Software & Cloud Development

- Proficiency in Visual Basic for Applications (VBA) for system automation.
- Experience with developer ecosystems including GitHub for version control and Microsoft Azure DevOps.

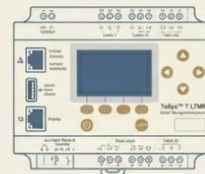
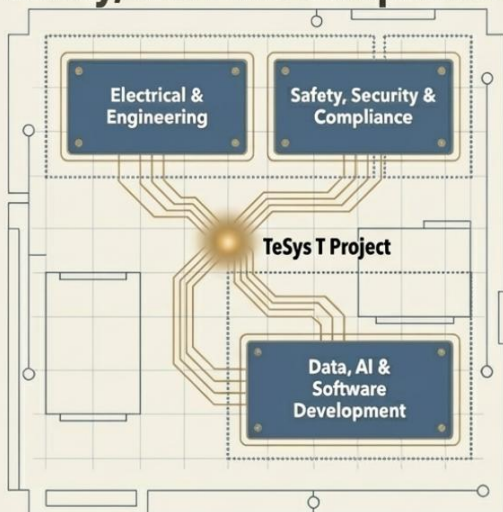
Cybersecurity

- Training in enterprise IT topics, code security reviews, and cloud security policies (GDPR).



NotebookLM

The Nexus of Application: Integrating Motor Management, Safety, and EMC Compliance



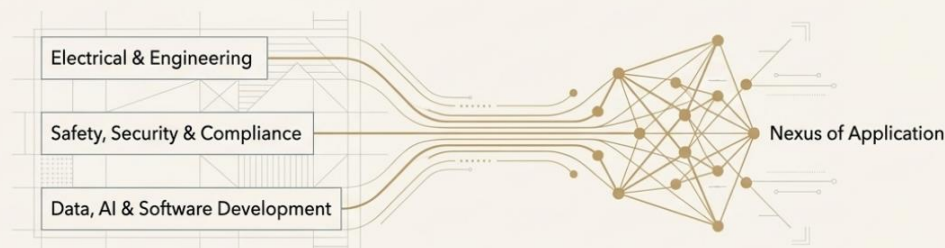
Case Study: Configuration and deployment of the TeSys™ T LTMR Motor Management System.

Integrated Skills in Action:

- **Pillar I (Electrical Engineering):** Wiring the LTMR controller, understanding power requirements (24 Vdc / 100-240 Vac), and configuring parameters for thermal overload, phase imbalance, and load behavior.
- **Pillar II (Compliance):** Ensuring adherence to EMC standards for industrial environments, applying functional safety principles, and managing risks associated with hardware/software failure.
- **Pillar III (Data & Software):** Utilizing configuration tools like SoMove and HMI devices (Magelis) to program the system and monitor diagnostics.

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The Nexus of Application: From Project Procurement to National Research Initiatives



Practical Project Management (Sci-Bono ICT Academy)

- **Scope:** "Proposed implementation option for phase 1 product database."
- **Process Design:** Architected a workflow across 14 departments.
- **Financials:** Managed procurement processes including requisitions (R1000), RFQs (R10000), and purchase orders (R10000).



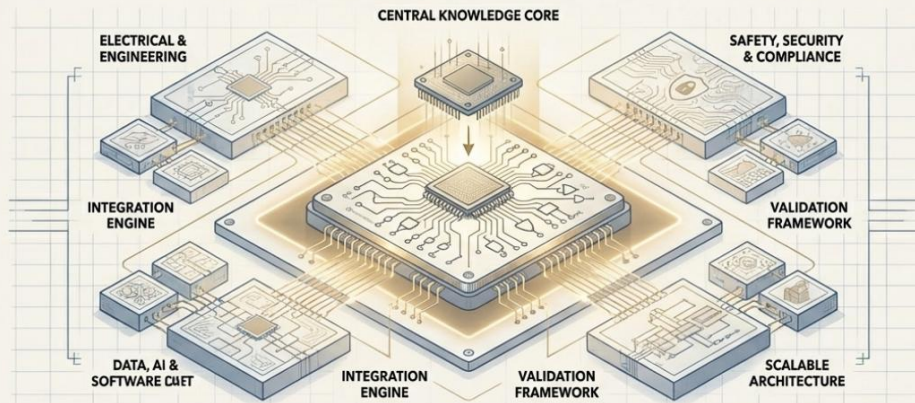
Strategic Research & Development (National Research Foundation)

- Authored and submitted multiple concept notes and grant applications.
- **Thematic Areas:** ICT, Health, Energy, Development Studies, and Agile Transport.
- Demonstrates the ability to synthesize knowledge across disciplines to frame and propose large-scale, innovative research projects.



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The Architecture of Synthesis: Engineering a Personal Knowledge Management System



Acquiring and applying knowledge is the foundation of expertise. The highest order of mastery, however, lies in creating systems to structure, validate, manage, and scale that knowledge.

The following slides showcase a self-designed architecture built using software development principles, formal logic, and deep regulatory analysis.

deep to regulatory analysis. This is the control system for a career—a framework designed for integrity, traceability, and continuous integration.

NotebookLM

System Component I: The Record Management Engine

Core Technology

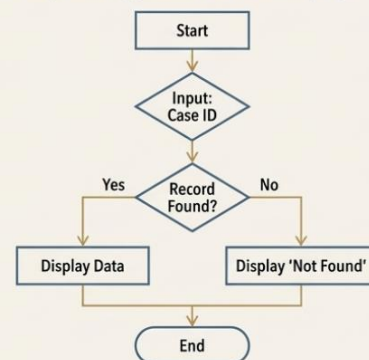
A bespoke system built in **Visual Basic for Applications (VBA)** to automate the management of career, educational, and legal records.

Key Features

- **Logical Flow Design ('Logigramme')**: Visual diagrams mapping high-level decision logic for processes like case search, filtering, and updates.
- **Procedural Logic ('Algorigramme')**: Code-based flowcharts detailing the procedural logic for custom UserForms, data validation, and database interactions.
- **Custom Interfaces ('UserForms')**: Development of modular forms (e.g., 'UserForm4', 'KfrmArchiveIPValidator') for specific tasks like certificate issuance, IP validation, and incident logging.
- **Data Integrity**: Implementation of a SHA-256 hash function in VBA to ensure the integrity of records.

```
Function CalculateSHA256(ByVal sIn As String) As String
    ' Example VBA Code Snippet for SHA-256 Hashing
    Dim oT As Object, oSHA256 As Object
    Set oT = CreateObject("System.Text.UTF8Encoding")
    Set oSHA256 = CreateObject("System.Security.Cryptography.SHA256Managed")
    CalculateSHA256 = ToHex(oSHA256.ComputeHash(oT.GetBytes_4(sIn)))
End Function
```

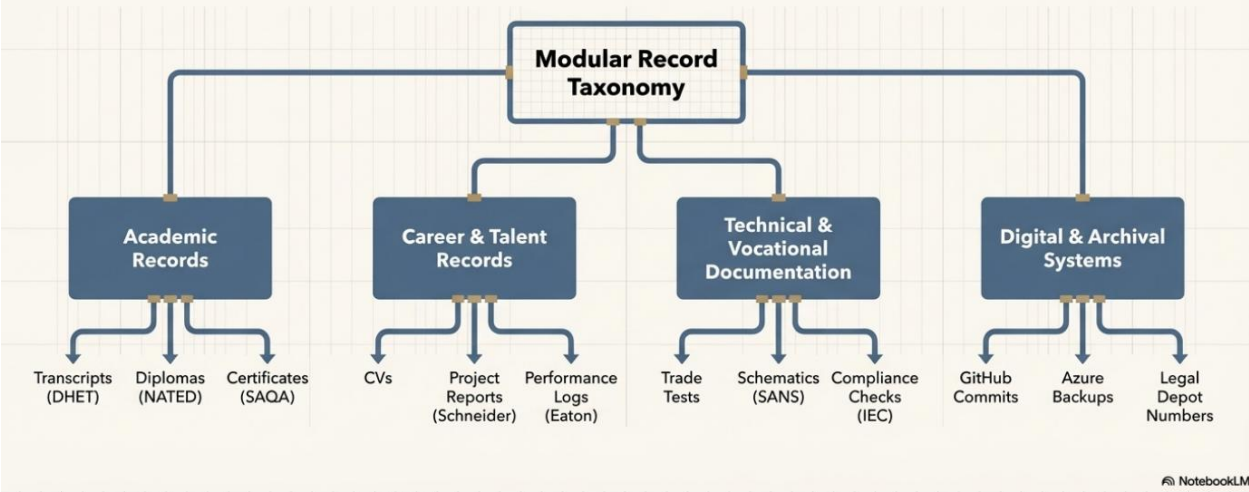
Simplified Logigramme: Case Processing Logic



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System Component II: A Formal Taxonomy for Integrated Credentials

A self-designed ‘Modular Record Taxonomy’ to classify and manage a diverse and sprawling body of evidence. This system creates a coherent structure for otherwise disconnected documents.



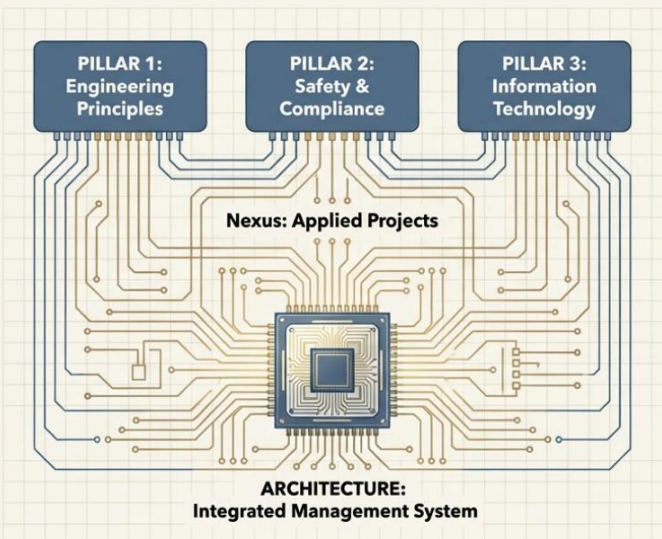
System Component III: The SAQA-Compliant Verification Framework

Overview: A deep analysis of the legal, technical, and design requirements for creating fully compliant South African national diplomas, showcasing the ability to architect credibility.

Analysis of SAQA-Compliant Certificate Elements	
Element	Description
Qualification Metadata	NQF Level (e.g., Level 6), Total Credits (360), SAQA QUAL ID, Progression pathways.
Security Features	QR codes, holograms, watermarks, integration with National Learners' Records Database (NLRD).
Legal Compliance	Adherence to Heraldry Act, Merchandise Marks Act, and NARS record-keeping standards.
Layout & Design	A4 size, 20-25mm margins, clear information hierarchy, placement of logos and seals.

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The Complete System: A Demonstrable Capability for Design, Analysis, and Synthesis



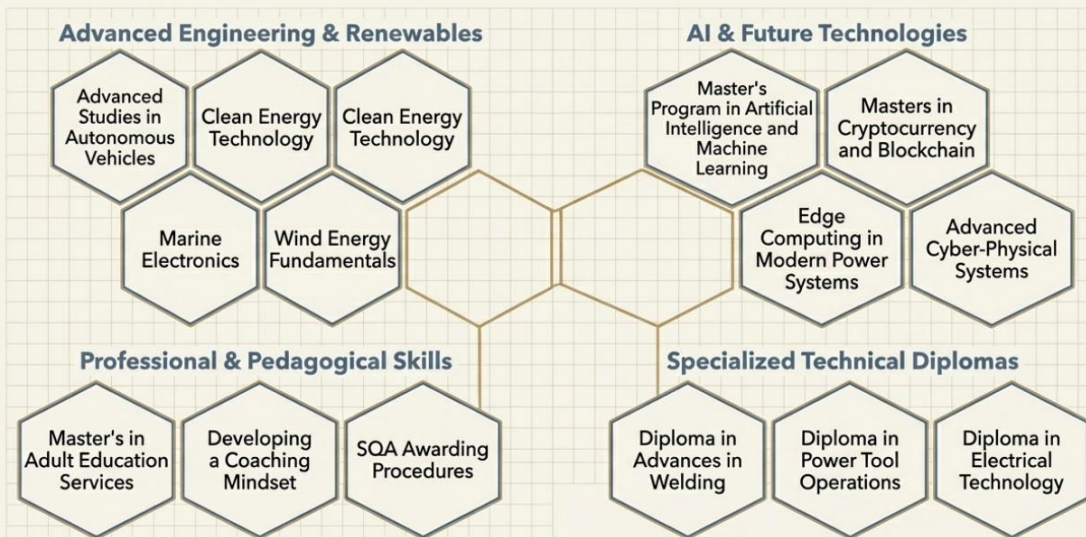
► **Foundational knowledge in Engineering, Safety, and IT** to analysis for matidate toeast in automatics, and condensal engineering distormats for milaras.

► **...is integrated through practical application in industrial automation, project management, and R&D** to easp analytics, naturadt management, and interests.

► **...and is managed, validated, and scaled by a self-designed architectural framework.** This architectural is genaeshemetry.

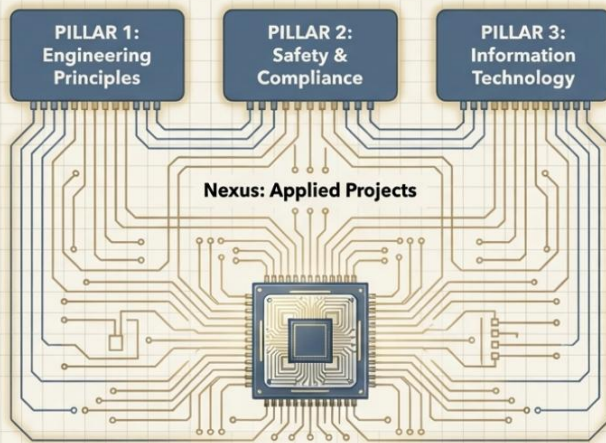
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Evidence of Continuous Learning: A Curation of Cross-Disciplinary Modules



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A Blueprint for Recognition



This portfolio demonstrates more than the sum of its parts. It is evidence of a systematic, architectural approach to building and validating professional capability.

The ability to synthesize disparate domains, solve complex problems, and engineer systems for knowledge management is a distinct and valuable form of expertise.

This architected system represents a robust model for lifelong learning and warrants formal recognition as a comprehensive and coherent body of work.

NotebookLM

The Integrated Architect

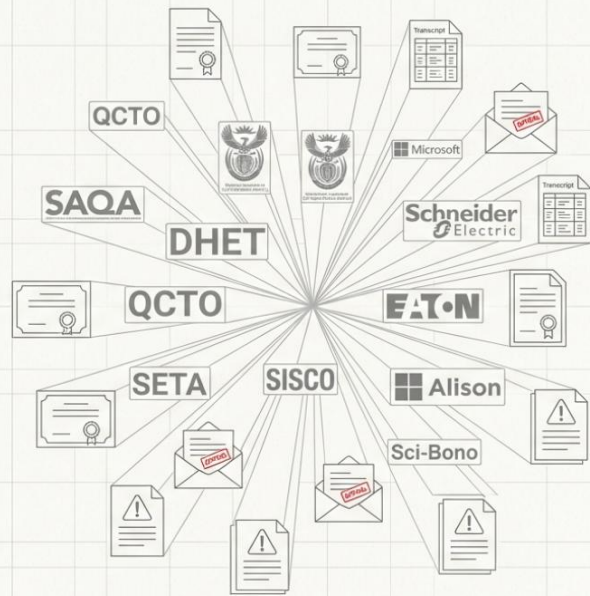
Synthesizing a Transdisciplinary Career from a World of Knowledge



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The Modern Professional's Dilemma: A World of Fragments

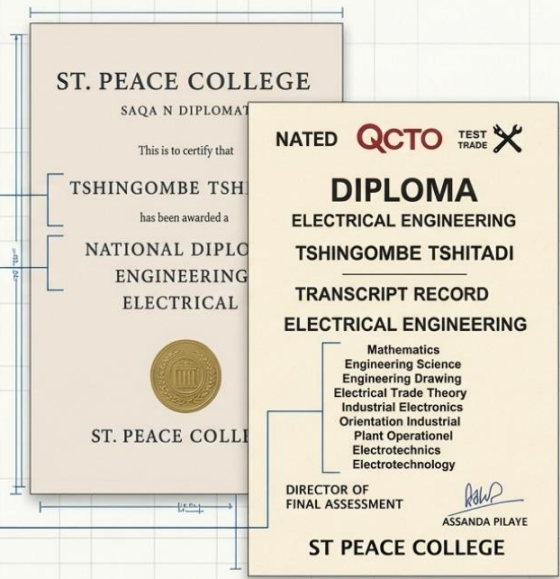
Expertise is abundant, but integration is scarce. In a world of continuous learning, professionals accumulate a vast collection of degrees, certificates, and digital badges. How do we build a coherent, verifiable identity from this fragmented journey?



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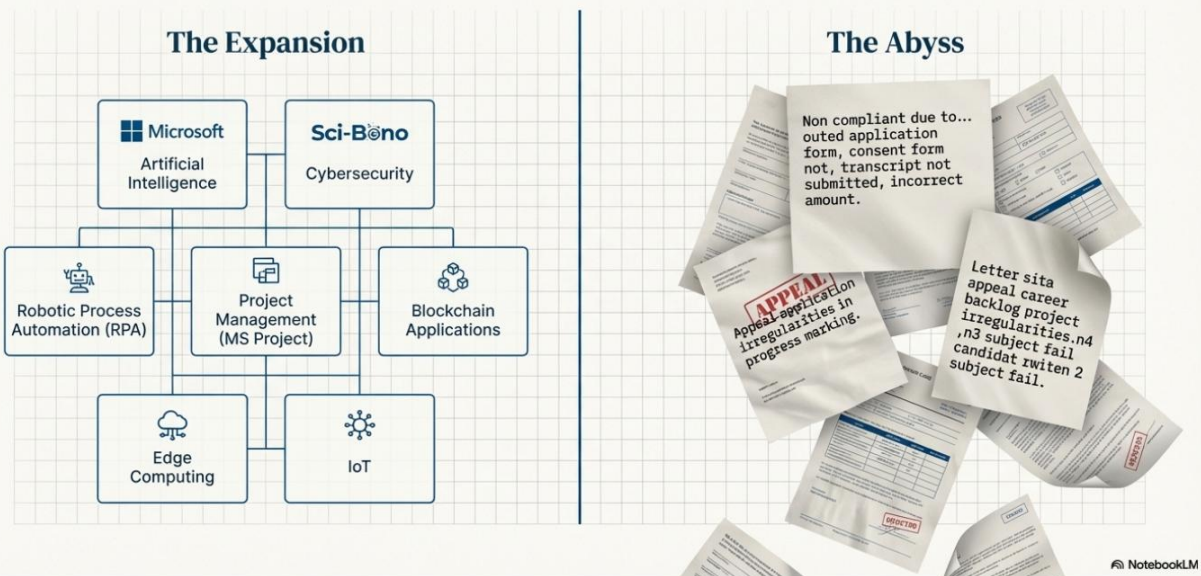
The Foundation: Forged in Engineering Mastery

The journey begins with a formidable, nationally recognized qualification in Electrical Engineering, demonstrating a deep command of core technical principles through the NATED (National Technical Education) framework.

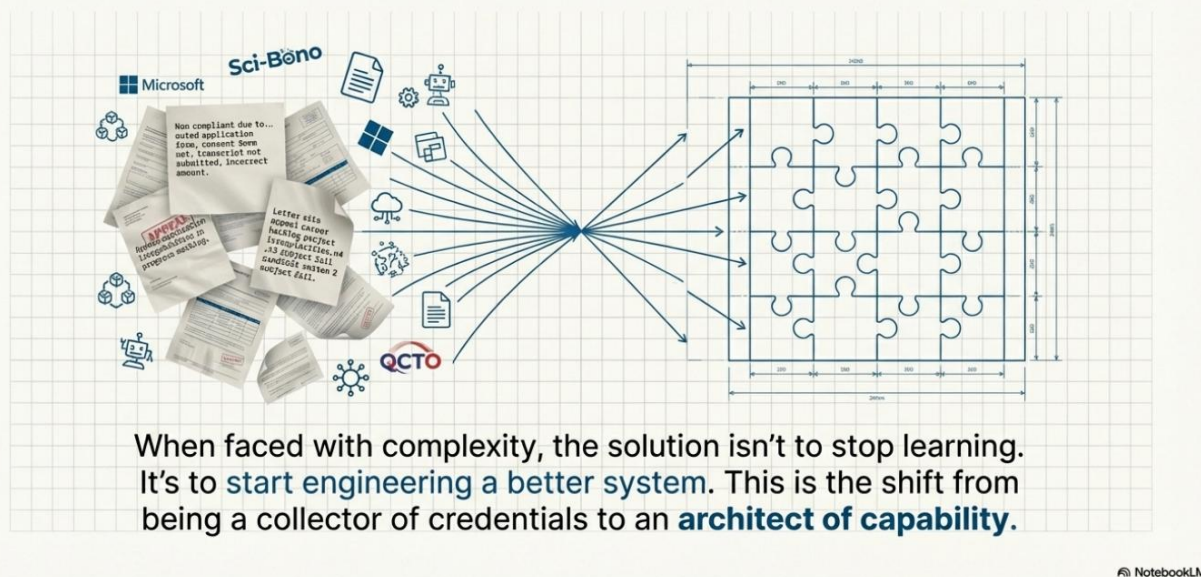


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The Expansion & The Abyss of Disintegration



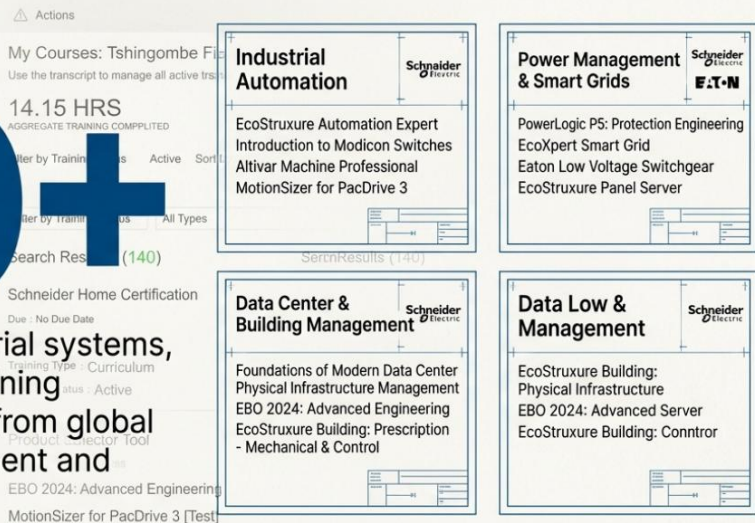
A New Blueprint: From Collector to Architect



The Raw Materials (I): An Industrial Knowledge Base

140+

A deep immersion in industrial systems, encompassing over 140 training modules and certifications from global leaders in energy management and automation.



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The Raw Materials (II): A Digital & Emerging Tech Portfolio

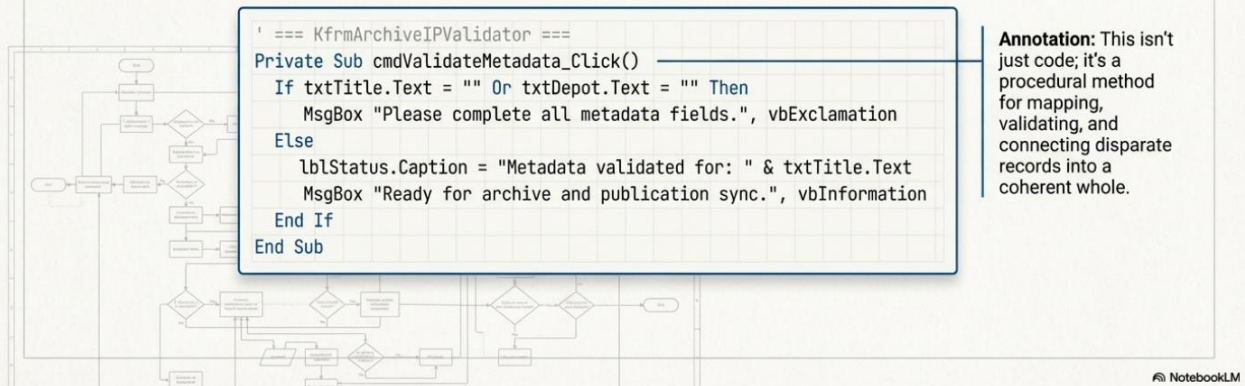
Expertise extends into the digital frontier, integrating foundational IT skills with advanced concepts in AI, cyber-physical systems, and data architecture from a diverse range of platforms.



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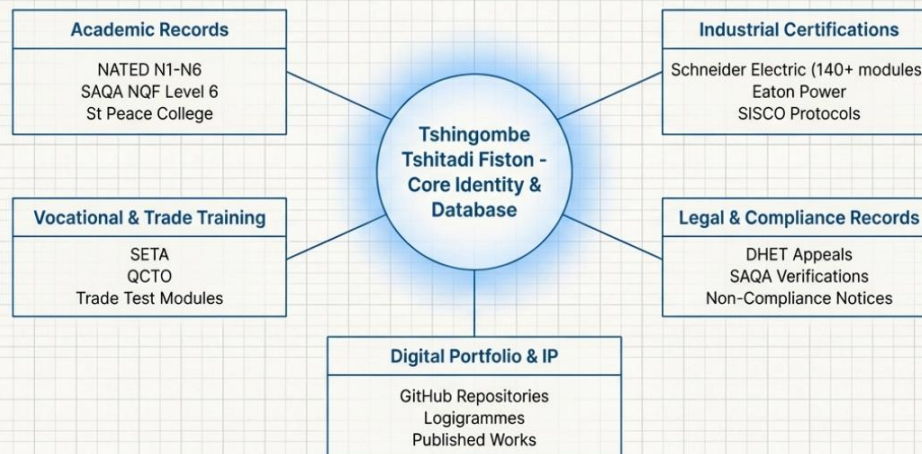
The System's Logic: Engineering with Logigrammes & Algorigrammes

To manage and integrate this vast knowledge base, a bespoke system was developed using procedural logic. This is the 'source code' that connects every credential, project, and skill into a unified, queryable database.



The Architecture in Practice: A Modular Framework

The system organizes a lifetime of learning into a modular, hub-and-spoke architecture. Each module represents a core facet of professional identity, interconnected and managed from a central database.



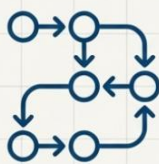
Ensuring Integrity: Verification, Security & Compliance

The architecture is built for trust. It integrates with official verification channels and incorporates modern digital credentialing technologies to ensure every qualification is authentic, auditable, and secure.



Official Verification

Integrates with SAQA VeriSearch and the National Learners' Records Database (NLRD) for authenticity checks.



Audit Traceability

Every record contains metadata including Qualification ID, NQF level, provider registration, and unique certificate numbers for a complete audit trail.



Enhanced Security

Employs security features like QR codes for instant verification and explores the adoption of blockchain and digital credentialing for tamper-proof records.



Compliance Framework

Designed to meet the requirements of SAQA, QCTO, and CHE.

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Output in Action: Designing the Smart Substation

An Integrated Architect can design, deploy, and manage a next-generation electrical substation by synthesizing knowledge from previously siloed domains.

Module 1: Power Systems

- Eaton LV Switchgear
- Schneider EcoStruxure Power

Module 2: Network & Control

- EcoXpert Smart Grid
- Cisco Network Protocols

Module 3: Data & AI

- AI for Predictive Maintenance (from AI Fluency)
- Data Analysis

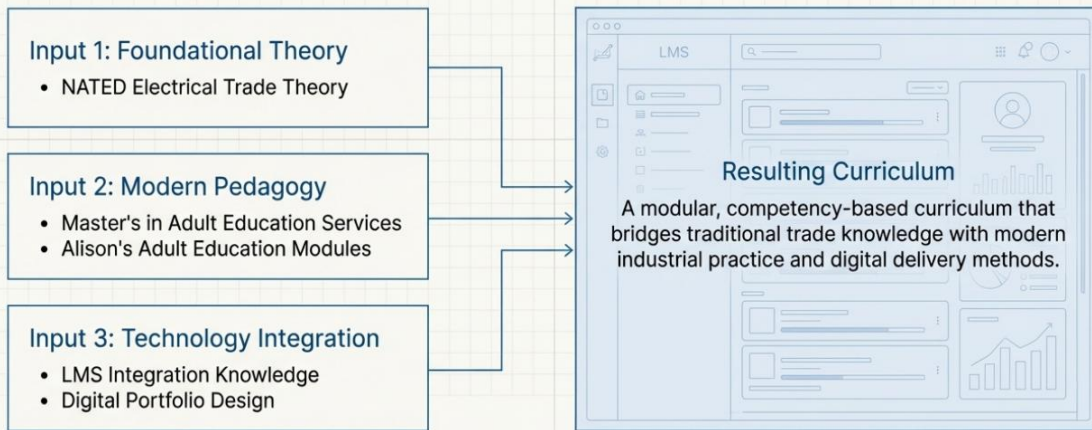
Resulting Capability

A fully integrated, intelligent, and resilient smart grid solution, from physical hardware to predictive software.

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Output in Action: Architecting the TVET Curriculum of the Future

The same integrated framework can be used to design holistic, industry-aligned learning pathways for the next generation of technicians and engineers.



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The System's Output Is a Verifiable Ecosystem of Capability

The result is not a static resume. It is a living digital portfolio—a dynamic, verifiable ecosystem where every project, publication, and credential is interconnected and accessible.



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The Value Proposition: The Integrated Architect

A new professional archetype for the age of complexity.



Sees the System, Not Just the Parts

Connects disparate technologies and disciplines to design holistic solutions.



Bridges Theory and Practice

Translates NATED-level trade theory into practical applications using platforms like Schneider EcoStruxure and Eaton Power Systems.



Unifies Hardware and Software

Combines deep knowledge of physical electrical components with the ability to design and build custom software systems (VBA, Logigrammes) for management and automation.



Designs Resilient Solutions

Builds robust systems—technical and pedagogical—for complex, multi-domain challenges.

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Tshingombe Tshitadi Fiston

National N Diploma: Electrical Engineering | Certified Systems Integrator

Contact Information

Email: tshingombefiston@gmail.com

LinkedIn: [linkedin.com/in/tshingombe-fiston](https://www.linkedin.com/in/tshingombe-fiston)

Digital Portfolio: portfolio.tshingombe.com

Verifiable IDs

Microsoft ID: 9953174

Schneider ID: 607069d9-fa26-423a-9d8c-d810df173a87

Ready to design the future.

NotebookLM



The Synthesizer's Portfolio

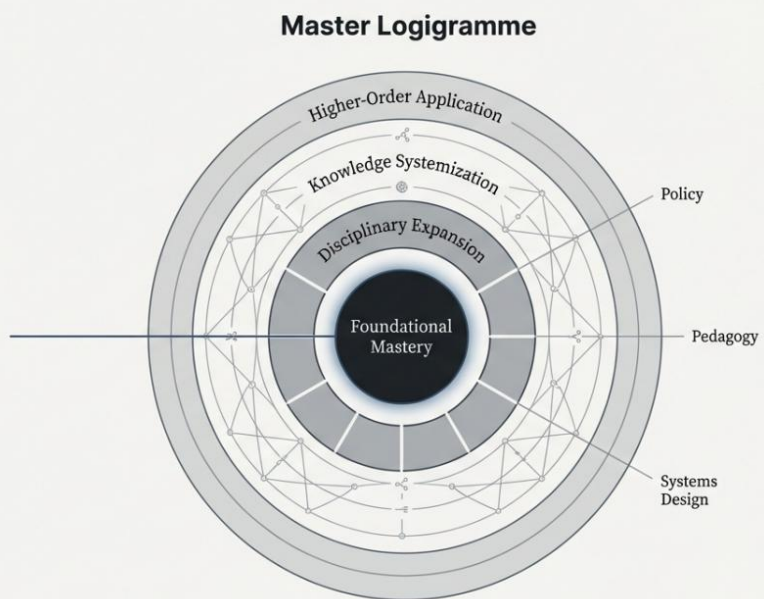
A Case Study in Building Transdisciplinary Mastery

 NotebookLM

The Modern Challenge Demands Integrated Expertise

Traditional, siloed learning pathways are insufficient for solving today's complex, interconnected problems. True mastery requires the ability to synthesize knowledge across diverse domains—from foundational engineering to future-focused technologies and systemic policy.

This portfolio is structured as a case study in building that capability, progressing through four distinct but integrated stages of mastery.

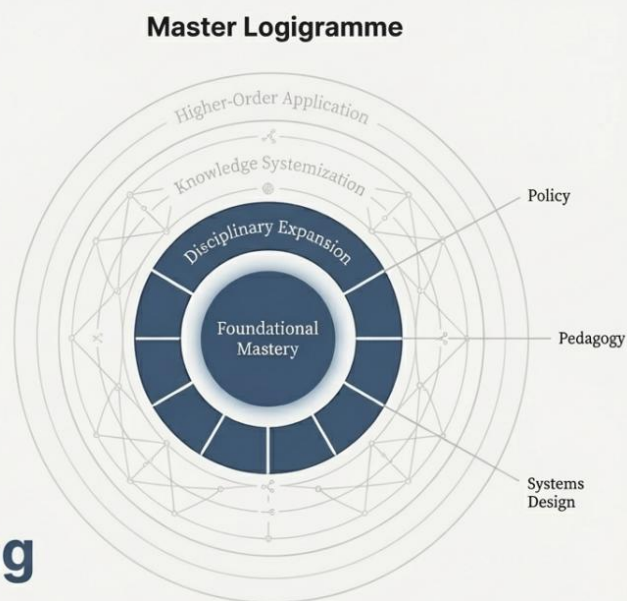


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Module I: Establishing a Foundation of Technical Mastery

The journey begins with deep, accredited expertise in a core domain: Electrical Engineering. This provides the theoretical and practical bedrock for all subsequent learning and synthesis. Every advanced concept is anchored to these fundamental principles.

National N Diploma: Electrical Engineering



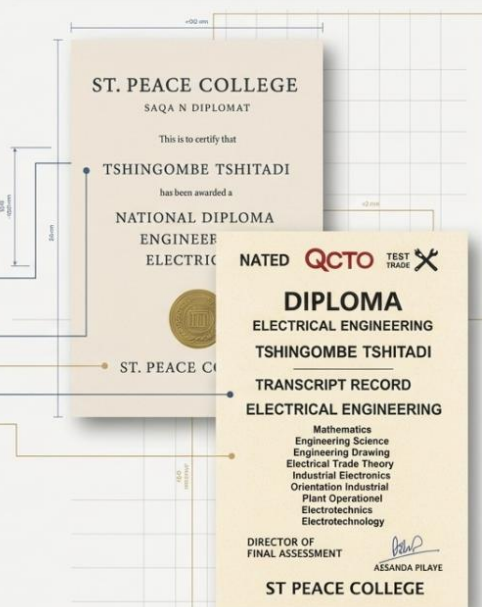
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Evidence: The National N Diploma (NQF Level 6)

A comprehensive qualification awarded by St. Peace College and accredited under the South African Qualifications Authority (SAQA) framework.

- **Qualification Title:** National N Diploma: Engineering Studies (Electrical Engineering)
- **SAQA QUAL ID:** 66994 / 90674
- **NQF Level:** 6
- **Total Credits:** 360
- **Core Subjects:** Mathematics, Engineering Science, Electrical Trade Theory, Industrial Electronics, Electrotechnics, Plant Operation.

This demonstrates mastery over fundamental engineering principles, validated against rigorous national standards and requiring 24 months of practical experience.



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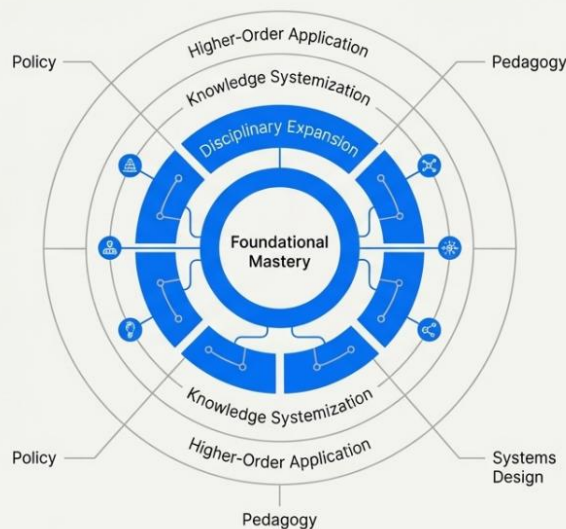
Module II: Expansion Across Future-Focused Disciplines

Building upon the engineering foundation, this phase involved a multi-platform, self-directed curriculum focused on the technologies shaping the future of industry: industrial automation, sustainable energy, advanced cybersecurity, and artificial intelligence.

140+

active courses on a single corporate platform.

Master Logigramme



NotebookLM

Evidence: Mastering Industrial Automation & Energy Management

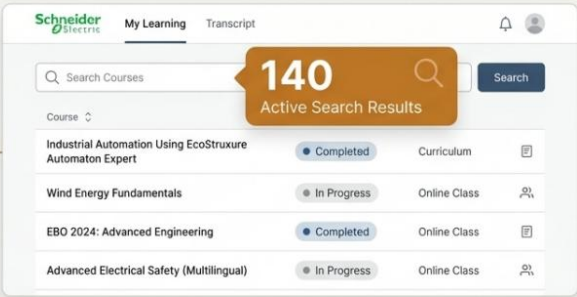
An extensive, ongoing training transcript with Schneider Electric, focusing on their EcoStruxure platform, power systems, and industrial automation.

Key Training Curricula

- **Automation:** Industrial Automation Using EcoStruxure, Altivar Machine Professional, Modicon Switches.
- **Power & Energy:** PowerLogic P5: Protection Engineering, Wind Energy Fundamentals, Professional Energy Manager LearningPath.
- **Cybersecurity & Safety:** Advanced Electrical Safety, How to Perform a Security Code Review.

14.15 HRS

Aggregate Training Completed
(Fiscal Year End 12/31/2025)



So What? “This demonstrates proficiency in proprietary, industry-leading technologies for automation, grid management, and operational security.”

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Evidence: Proliferation of Skills Across Digital Platforms

A curated selection of advanced courses and diplomas completed across platforms like Alison and AIU, organized into strategic capability clusters.

Cluster 1: AI & Intelligent Systems		Cluster 2: Cyber-Physical & Edge Computing	
 Master's in Artificial General Intelligence	 Master's Program in AI and Machine Learning for Software Engineering	 Advanced Cyber-Physical Systems in Telecommunications	 Edge Computing in Modern Power and Energy Systems
Cluster 3: Blockchain & DLT		Cluster 4: Renewable Energy & Sustainability	
 Masters in Cryptocurrency and Blockchain Applications	 Masters in Distributed-Ledger Technology Applications in Educational Technology	 Clean Energy Technology	 Energy Storage and Battery Technology

So What? “This illustrates a proactive and systematic approach to acquiring expertise in disruptive technologies, ensuring relevance and future-readiness.”

NotebookLM

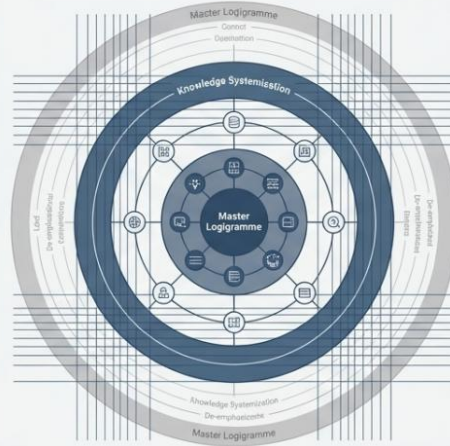
Module III: Systemization of Knowledge

Acquiring knowledge is only the first step. The real challenge is to manage, connect, and operationalize it. This phase focuses on building custom systems and frameworks to transform a vast repository of information into an integrated, queryable, and actionable knowledge base.

Key Concepts Introduced

Logigramme, Algorigramme, Visual Basic for Applications (VBA).

Logigramme, Algorigramme, Visual Basic for Applications (VBA).



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Evidence: Engineering a Personal Knowledge Management System

To manage the complexity of this multi-domain portfolio, a custom record management system was designed and implemented using Visual Basic for Applications (VBA). This system uses logical frameworks to track, validate, and connect every piece of evidence.

Logigramme (Workflow Logic)

Defines the high-level decision flow for processing new records, from academic transcripts to legal documents and technical modules.



Algorigramme (Procedural Logic)

Implements the decision flow in code, automating the sorting and routing of evidence. Example logic:

```
Select Case recordType
Case "Academic": Call ValidateTranscript()
Case "Technical": Call MapToEngineeringModule()
Case "Legal": Call RouteToLegalBody()
End Select
```



So What? “This demonstrates a rare, meta-level skill: the ability to architect systems for managing complexity and creating a coherent whole from disparate parts.”

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Application: A Self-Designed Credential & Cost Ledger

The system generates a modular record book that tracks credentials, costs, and compliance data, creating a fully auditable and portable portfolio.

Date	Institution	Item/Module	Sale Price	Amendment	Final Cost	Award	Library Usage	Booking	Notes
2025-10-08	CPS Institute	CPS Architecture & IoT Lab	R1,500	-R400	R1,100	Certificate – CPS Integration	4h	Sensor Workshop (2h)	GitHub + SAQA/NQF

Tracked Metadata Includes

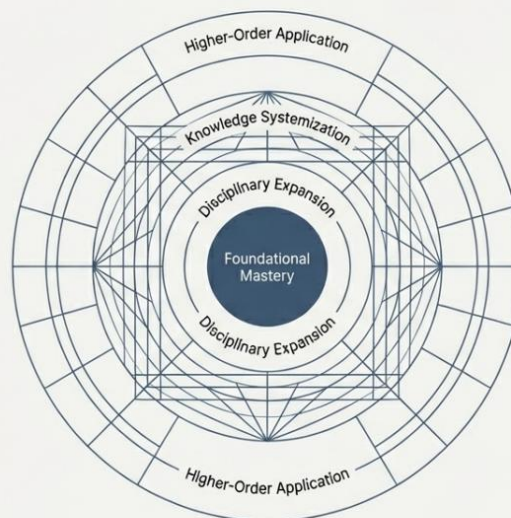
- Costs & Amendments (grants, subsidies)
- Awards & Recognitions
- Library & Bibliotech Usage
- Bookings for Labs & Diagnostics
- SAQA/NQF Mapping
- Export Targets (GitHub, LMS, Archive.org)

So What? "This transforms a collection of certificates into a dynamic, **data-driven asset for audit, compliance, and strategic career planning.**" 🍌

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Module IV: Application to Higher-Order Systems

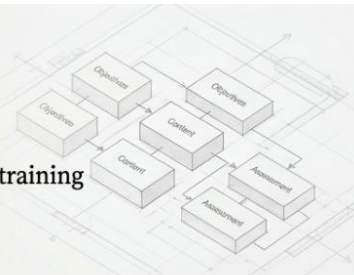
The ultimate purpose of synthesized knowledge is its application. This final phase demonstrates the use of the integrated skill set to design educational curricula, navigate complex regulatory frameworks, and contribute to systemic improvements in technical and professional domains.



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Evidence: Designing and Structuring Technical Curricula

Leveraging deep technical knowledge to architect and outline comprehensive training modules suitable for TVET colleges, corporate training, and online platforms.



Examples of Curriculum Development

- **Electrical Engineering Fundamentals:** Modular framework covering Ohm's Law, Power & Energy, DC/AC circuits, and communication engineering.
- **Safety & Compliance:** Modules on Electrical Safety, Chemical Management, and OHSA statutory requirements, mapped to SAQA descriptors.
- **Didactic Integration:** Development of lesson plans, assessment rubrics, moderation templates, and career matrices aligned to SAQA exit level outcomes.
- **LMS Strategy:** Design of Learning Management System (LMS) integration, including self-enrollment guides and credential showcasing.

So What? *This demonstrates the ability to translate expert knowledge into effective learning experiences, a critical skill for leadership, mentorship, and institutional development.*

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Evidence: Mastering the Regulatory & Compliance Landscape

A core competency is the analysis and application of regulatory standards governing qualifications, electrical installations, and security services.

Demonstrated Expertise in:



- **SAQA/NQF Frameworks:** Detailed analysis of qualification types, NQF levels, total credits, security features (holograms, QR codes), and verification via the National Learners' Records Database (NLRD).



- **Electrical Compliance (SANS):** Voltage drop calculations, busbar current density (SANS 60439-1), circuit requirements, and disconnecting device protocols.



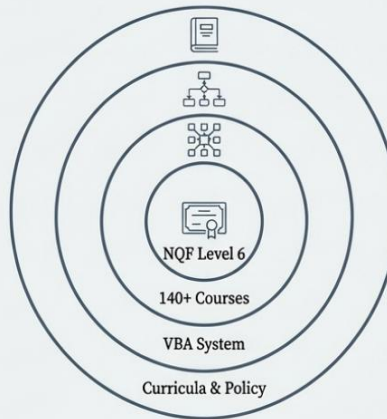
- **Private Security Regulation (PSIRA):** Understanding of the PSIRA Act 56 of 2000, grading, application requirements, and the code of conduct for security providers.

So What? *This proves an ability to operate not just within technical specifications, but within the broader legal and policy systems that ensure quality, safety, and accountability.*

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A Blueprint for Lifelong Synthesis

This portfolio documents a journey from foundational expertise to a self-architected system for continuous learning, synthesis, and application. It represents a deliberate methodology for building transdisciplinary mastery—a repeatable blueprint for navigating the future of work and education.



The Journey Recapped

1. **Foundation:** Anchored in a formal NQF Level 6 Engineering Diploma.
2. **Expansion:** Proliferated across 140+ courses in AI, automation, and energy.
3. **Systemization:** Architected a custom VBA system with logigrammes to manage complexity.
4. **Application:** Deployed expertise to design curricula and master regulatory policy.

NotebookLM

An Integrated Professional Identity

A portfolio of evidence unified under a verifiable digital identity across key national and global systems.

 Microsoft **Microsoft ID:** 9953174



South African Reserve Bank (SARB): ID 61095446



Schneider Electric ID:
607069d9-fa26-423a-9d8c-
d810df173a87



Central Supplier Database (CSD Treasury): R016921978



South African Revenue Service (SARS): SF7478

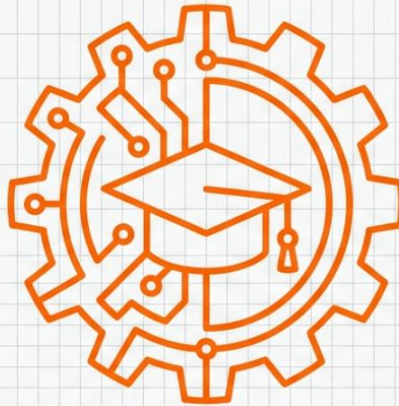


SETA LMS ID: 127952

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Architecting the Future of Technical Education

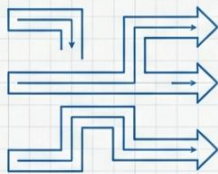
A Blueprint for an Integrated, Compliant, and Career-Aligned Qualification Framework



NotebookLM

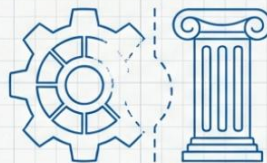
The Challenge: A Fragmented Educational Landscape

South Africa's technical and vocational education system is a complex ecosystem of siloed qualifications, disparate regulatory bodies, and a persistent gap between learning outcomes and industry needs.



Siloed Pathways

Learners navigate a maze of qualifications from different authorities (e.g., NATED N1-N6, National N Diplomas) with unclear progression and equivalence. Key regulatory bodies mentioned: **DHET**, **QCTO**, **CHE**.



Industry-Academia Disconnect

Theoretical knowledge is often divorced from the practical, hands-on competencies required by sectors like manufacturing (**MERSETA**), chemical industries (**CHIETA**), and ICT (**ISETT SETA**).



Credential Insecurity

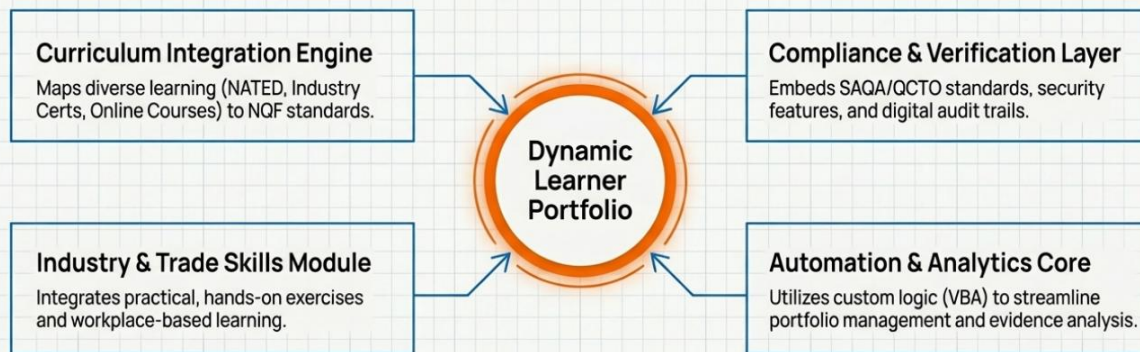
The lack of a unified verification system creates risks of qualification fraud and makes it difficult for employers to validate skills, undermining the value of legitimate credentials.

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The Solution: An Integrated Competency Framework

We propose a holistic, digitally-native framework that unifies disparate educational streams into a single, verifiable, and dynamic portfolio of competence. This is the blueprint for transformation.

The Integrated Competency Framework



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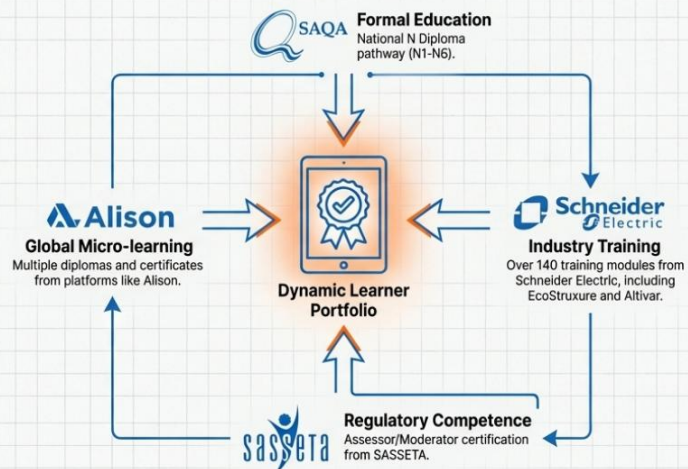
The Core Component: The Dynamic Learner Portfolio

The portfolio is the central nervous system of the framework. It's a verifiable, multi-source repository of a learner's lifelong journey, capturing everything from formal diplomas to industry micro-credentials and practical project work.

Case in Point: A Portfolio of Synthesis

The framework is prototyped through the extensive portfolio of Tshingombe Tshitadi, which integrates:

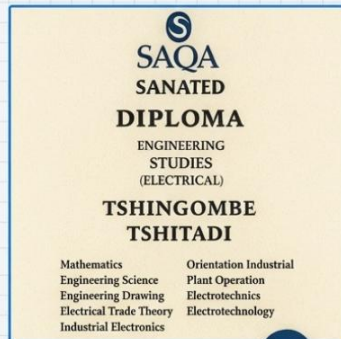
- **Formal Education:** National N Diploma pathway (N1-N6).
- **Industry Training:** Over 140 training modules from Schneider Electric, including EcoStruxure and Altivar.
- **Regulatory Competence:** Assessor/Moderator certification from SASSETA.
- **Global Micro-learning:** Multiple diplomas and certificates from platforms like Alison.



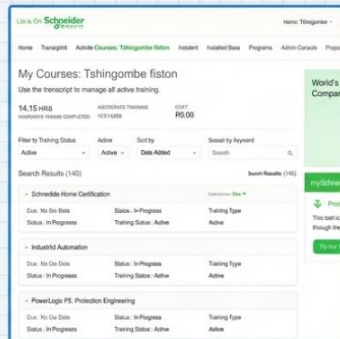
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Evidence in Action: Deconstructing a Competency Portfolio

The strength of the portfolio lies in its validated, multi-faceted evidence. Each artifact is a data point representing a specific competency, mapped against a recognized standard.



Formal National Qualification



Industry-Specific Training

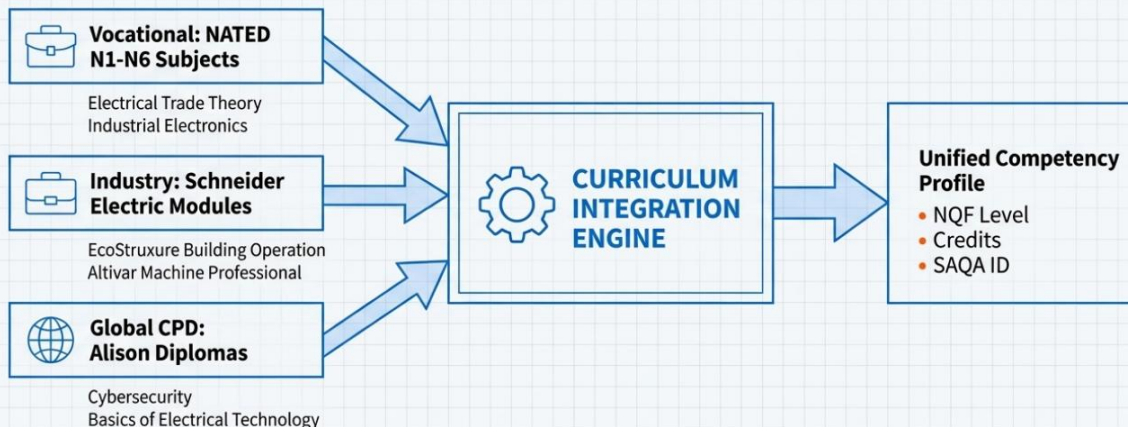


Regulatory & Skills-Based Certification

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The Engine: Mapping a World of Knowledge to a Single Standard

The framework's engine normalizes credentials from varied sources against South Africa's National Qualifications Framework (NQF). It translates industry training, practical skills, and international courses into a common language of levels, credits, and competencies.



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From Theory to Trade: Integrating Verifiable Practical Skills

The framework prioritizes evidence of applied skill. Detailed practical exercises, drawn from accredited trade manuals, are documented and assessed within the portfolio, providing proof of hands-on competence.



Exercise 4.1.168: Make a Printed Circuit Board for Power Supply

Objective: Transfer a circuit layout, etch tracks using FeCl_3 , drill component holes, and prepare a functional PCB.

Evidence Artifacts

Photos of the board at each stage (layout transfer, etching, final product), instructor validation log.



Exercise 4.1.170: Troubleshoot Defects in Simple Power Supplies

Objective: Diagnose component-level faults using logical troubleshooting and measurement tools.

Evidence Artifacts

Diagnostic report, CRO screenshots, log of measurements taken.

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The Compliance Layer: Engineering Trust and Verifiability

Every credential and competency within the framework is anchored in national regulatory standards. The system is designed for auditability, security, and seamless verification by employers and institutions.



- **Regulatory Alignment:** Explicit mapping to SAQA, QCTO, and DHET policies, including NQF Levels and Credit Values.



- **Digital Verification:** Integration with national databases like SAQA's VeriSearch and the National Learners' Records Database (NLRD) for instant authentication.



- **Secure Credentialing:** Implementation of anti-fraud features on all generated certificates.



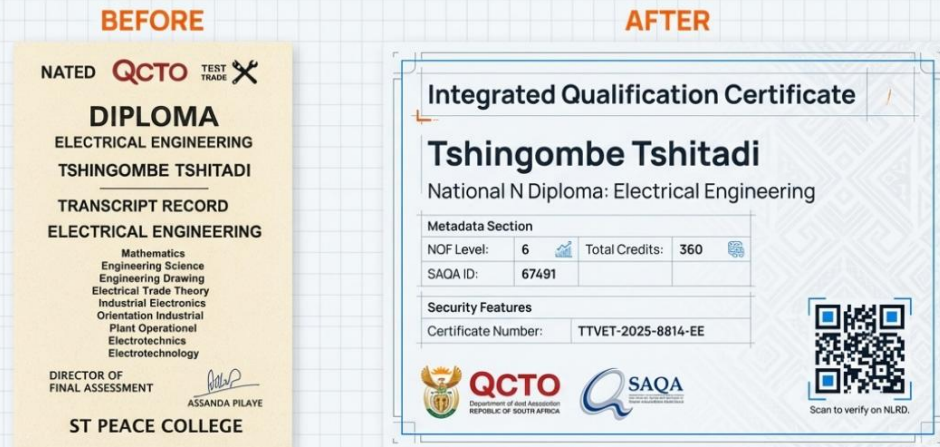
- **Legal Foundation:** Adherence to foundational laws like the Merchandise Marks Act and Copyright Act for the use of official symbols.



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Redesigning the Credential: From Static Paper to Dynamic Proof

The framework reimagines the traditional certificate as a secure, data-rich document that is both human-readable and machine-verifiable.



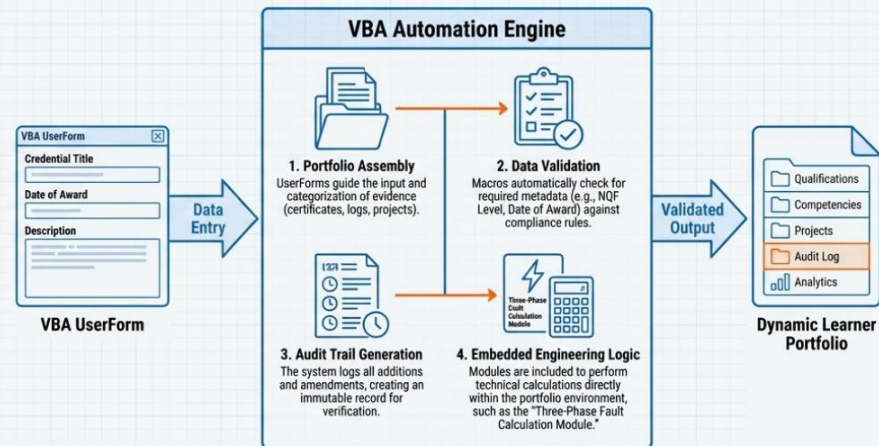
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The Automation Core: A VBA System for Portfolio Management

To manage the complexity of a rich, multi-source portfolio, a custom VBA (Visual Basic for Applications) macro and form control system has been developed. It automates critical administrative and analytical tasks.

System Capabilities

- Portfolio Assembly:** UserForms guide the input and categorization of evidence (certificates, logs, projects).
- Data Validation:** Macros automatically check for required metadata (e.g., NQF Level, Date of Award) against compliance rules.
- Audit Trail Generation:** The system logs all additions and amendments, creating an immutable record for verification.
- Embedded Engineering Logic:** Modules are included to perform technical calculations directly within the portfolio environment, such as the "Three-Phase Fault Calculation Module."

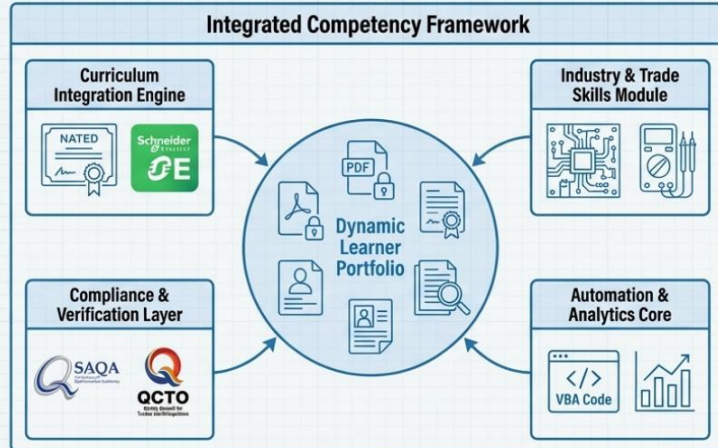


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Proof of Concept: A Unified Engineering Dossier

The portfolio of Tshingombe Tshitadi serves as a complete, functional prototype of the Integrated Competency Framework. It is not merely a collection of documents, but a live demonstration of a system that successfully integrates:

- **Multi-Authority Qualifications:** From NATED and SASSETA.
- **Deep Industry Expertise:** From Schneider Electric and Eaton.
- **Rigorous Practical Skills:** From NSQF-aligned trade manuals.
- **Robust Compliance:** With SAQA NQF standards.
- **Systemic Automation:** Through a custom VBA engine.



NotebookLM

A Scalable Model for National Transformation

This blueprint is designed for adoption by TVET colleges, Sector Education and Training Authorities (SETAs), and national regulators. It offers a clear path to a more coherent, credible, and agile technical education system.



For Learners

- Provides clear pathways, recognizes all forms of learning (RPL), and creates a portable, verifiable record of competence.



For Industry

- Delivers graduates with proven, relevant skills and simplifies the credential verification process, reducing hiring risk.



For Institutions

- Offers a framework for curriculum modernization, improves auditability, and fosters closer ties with industry partners like City Power and Eskom.



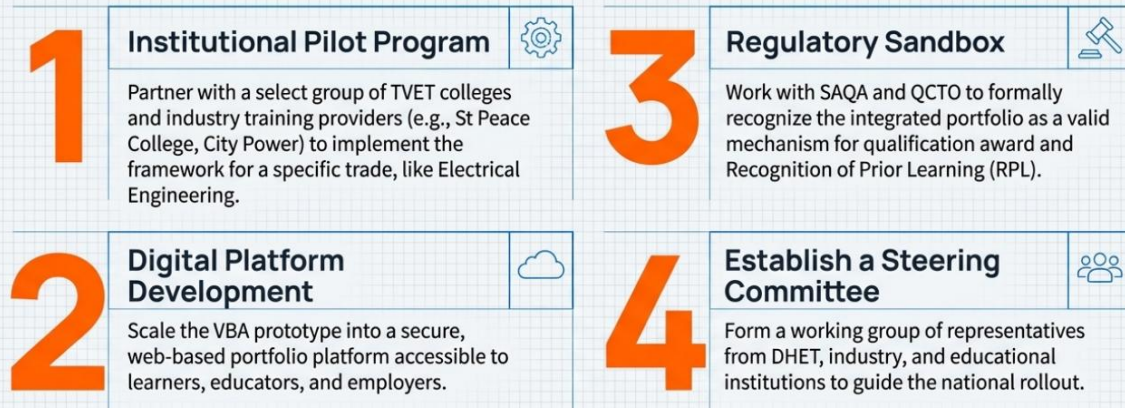
For Regulators

- Enhances the integrity of the NQF, combats credential fraud, and provides richer data on skills development.

NotebookLM

The Pathway to Implementation

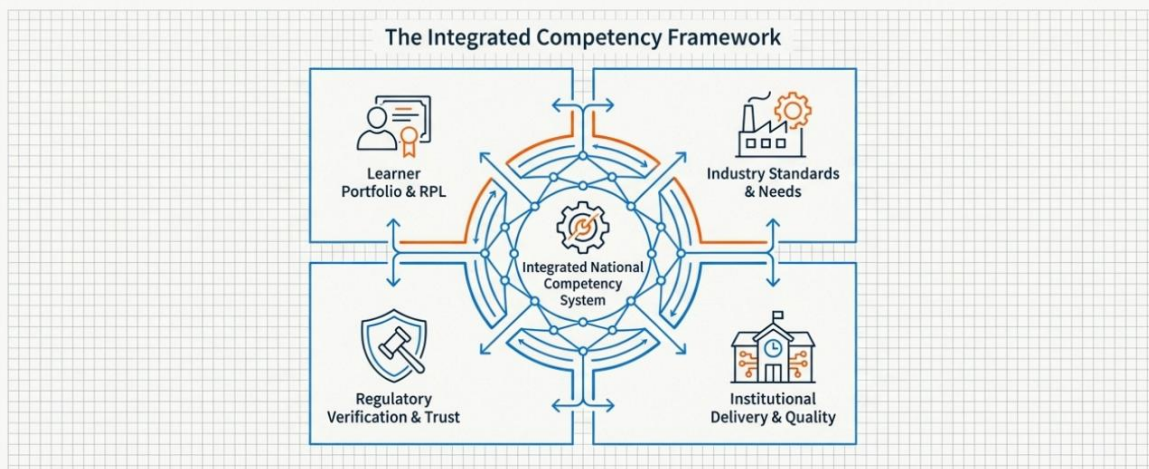
Moving this blueprint from prototype to national standard requires a collaborative, phased approach.



NotebookLM

The Blueprint Exists.

An integrated, secure, and industry-aligned future for technical education is not a theoretical goal. It has been designed, prototyped, and validated.



NotebookLM

Building Your Professional Legacy: A Blueprint for a Modular Career Portfolio

PHASE 1: AGGREGATE & DIGITIZE ALL RECORDS

Gather All Formal Qualifications
Collects official formal academic credentials



Document Industry-Specific Training
Specialized industry-specific training

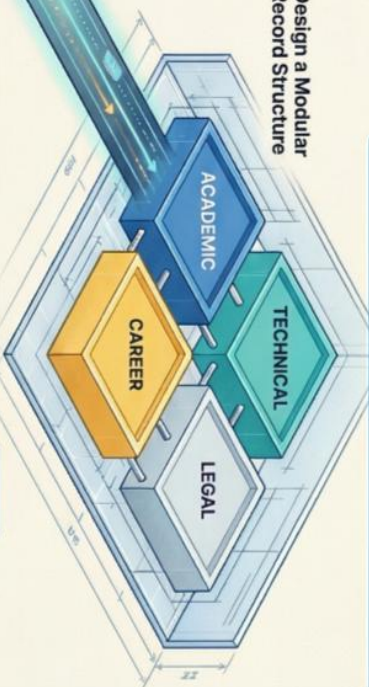


Archive All Official Correspondence
Digitize institutional communications, compliance letters, and legal records for a complete audit trail.



PHASE 2: STRUCTURE & SYSTEMIZE YOUR PORTFOLIO

Design a Modular Record Structure



Map Workflows with Logic Diagrams
Use logigrammes (flowcharts) and algorithms (code logic) to define data validation rules.



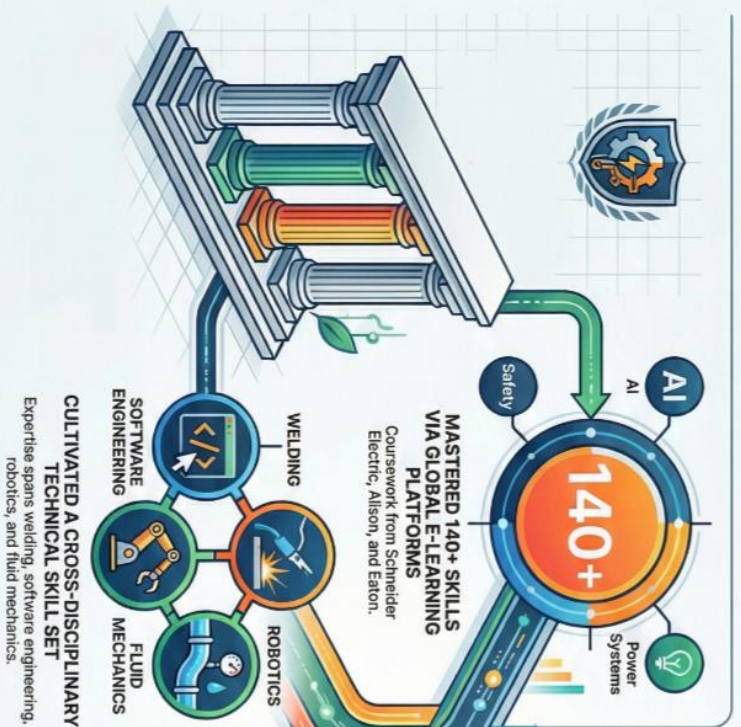
Build an Export-Ready Digital System
Create a final portfolio ready for audits, job applications, and archival platforms.



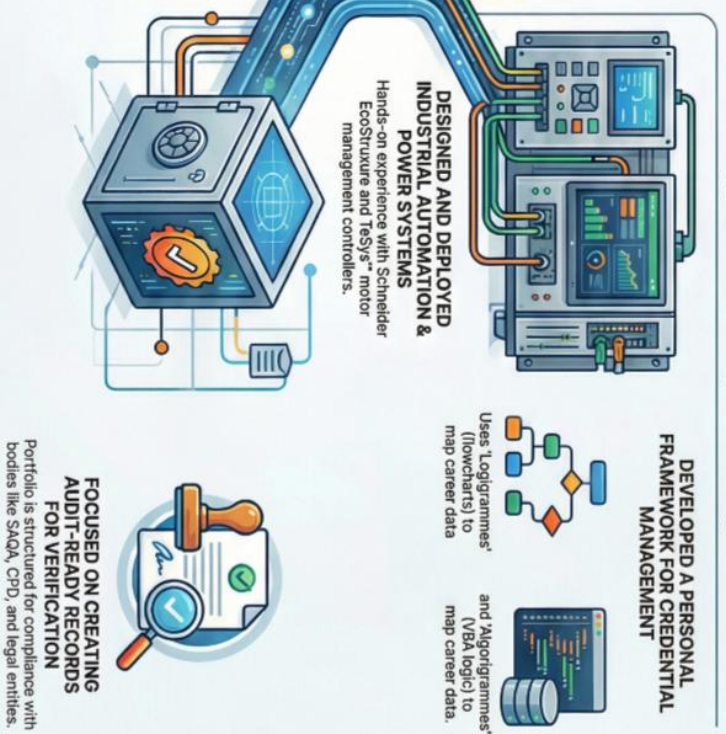
NotebookLM

The Integrated Career Portfolio: A Blueprint for Lifelong Learning

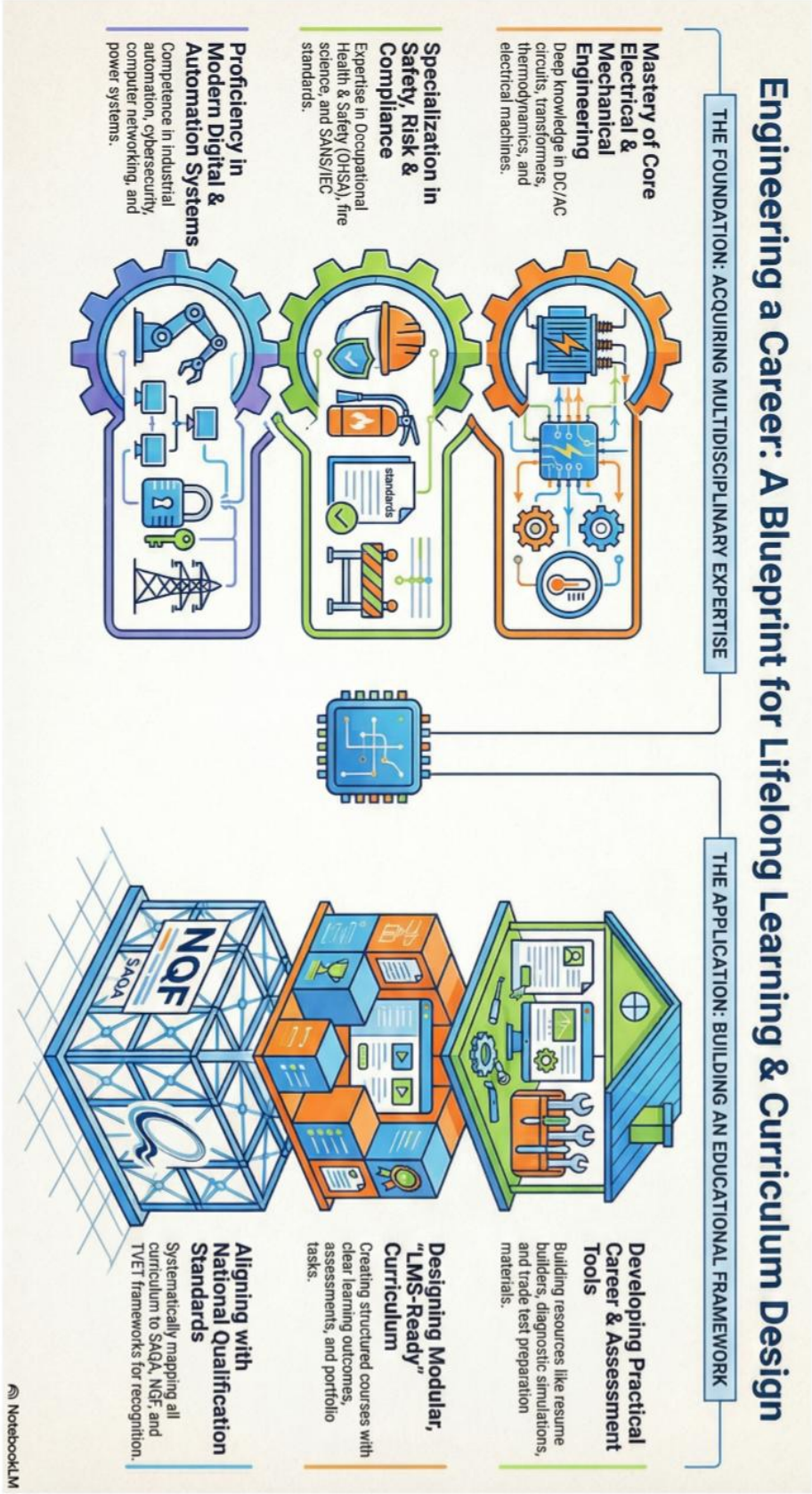
Foundational & Professional Learning



Applied Skills & System Integration



Engineering a Career: A Blueprint for Lifelong Learning & Curriculum Design



Building Your Professional Legacy: A Blueprint for a Modular Career Portfolio

Phase 1: Aggregate & Digitize All Records

Gather All Formal Qualifications

Collect diplomas, certificates (SAGA, NATED, CPD), and transcripts from all institutions.

Document Industry-Specific Training

Include specialized training logs from platforms like Schneider Electric, Eaton, and Microsoft.

Archive All Official Correspondence

Digitize institutional communications, compliance letters, and legal records for a complete audit trail.

Phase 2: Structure & Systemize Your Portfolio

Design a Modular Record Structure

Academic

Career

Technical

Legal

Map Workflows with Logic Diagrams

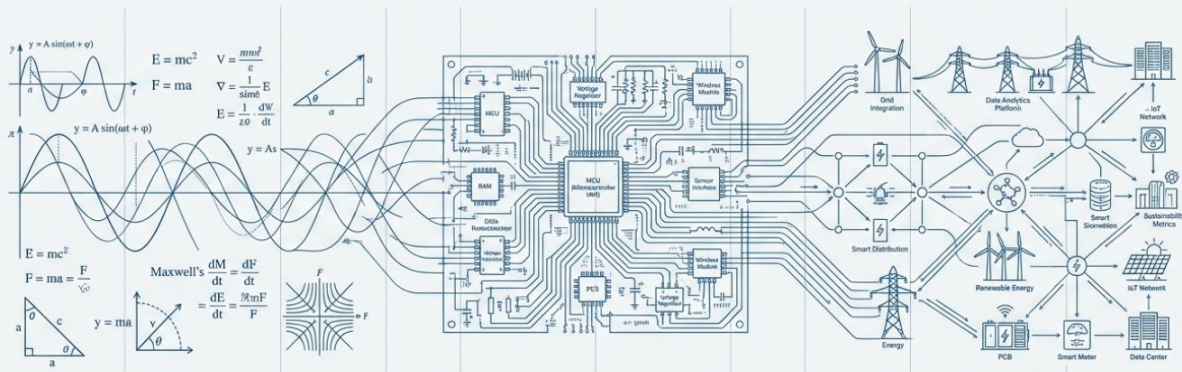
Use logigrammes (flowcharts) and algorithms (code logic) to define data validation rules.

Build an Export-Ready Digital System

Create a final portfolio ready for audits, job applications, and archival platforms.

Forging an Engineer: A Journey from Core Principles to Systemic Innovation

The Portfolio of Fiston Tshingombe Tshitadi



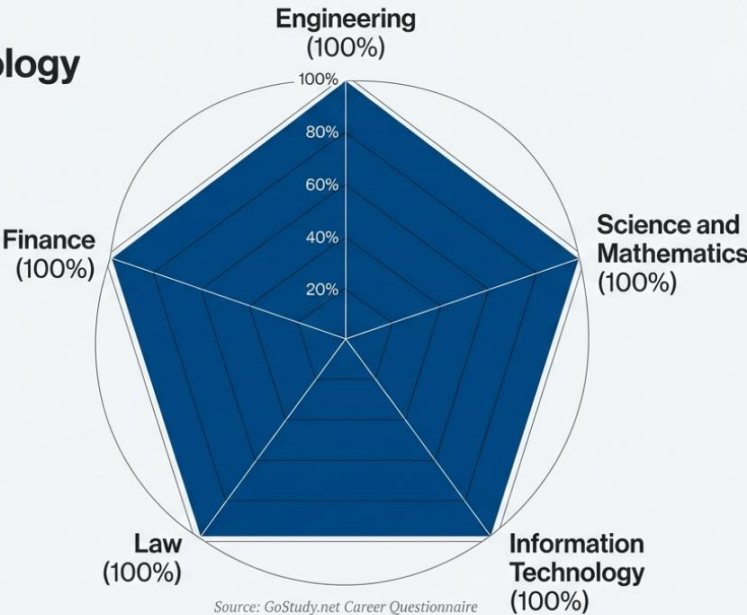
NotebookLM

An Innate Aptitude for Engineering and Technology

A successful engineering career begins with a natural inclination towards analytical and technical fields, as validated by objective career assessment.

Digital Proficiency

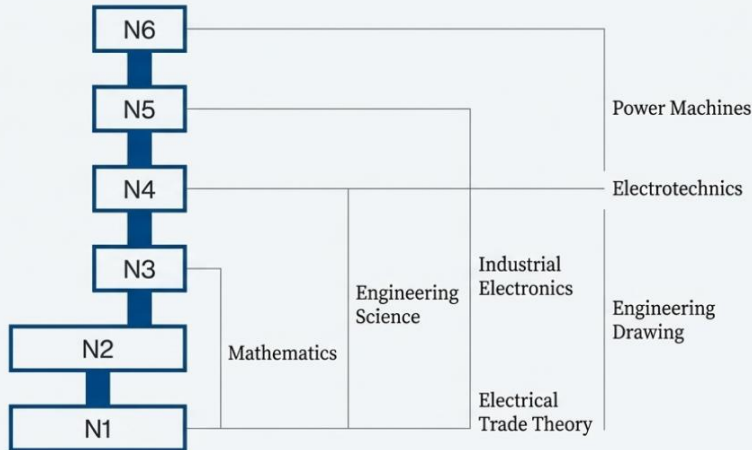
Further indicating a grasp of modern digital ecosystems through readiness for "Google Play Store Optimization" certification.



NotebookLM

A Structured Ascent Through National Engineering Qualifications

Progression through the South African N-Level qualifications (NATED) provides a structured, multi-level pathway to an engineering diploma, governed by national bodies including DHET, SAQA, and QCTO.



SAQA Verification

Awarded Diploma formally recognized under SAQA Qualification ID: 71638.

NotebookLM

From Blueprint to Reality: Applied Skills in the Engineering Laboratory

Bridging theory and practice through hands-on training with industry-standard didactic systems, translating abstract formulas into tangible, measurable results.



Key Skills (#6C757D)

- **Motor Analysis:** Set-up for DC shunt-wound motor "Load characteristic": Measure armature voltage and current; connect motor to starter; subject motor to a load.
- **Component Craftsmanship:** Detailed motor rewinding: remove winding, prepare new winding on a spool, solder and insulate, reassembly and test.
- **Power Electronics:** Experiments with Boost Converters and PWM inverters using DSPICE and Power-Pole test benches.
- **Transformer Testing:** Determination of efficiency and voltage regulation of single-phase transformers by direct loading.

NotebookLM

Engineering with Integrity: Adherence to National Safety and Installation Standards

Safe and reliable electrical installations are non-negotiable, governed by a framework of compulsory national standards ensuring practitioner and public safety.

Key Standards Cited				Applied Safety Principles	
	SANS 10142 (SABS 0142) The core standard for ensuring the basic safety of electrical installations.		VC 8036 Compulsory specification for circuit breakers.	• Protective conductor requirements for all new installations. • Strict rules for Distribution Board mounting, accessibility, and labeling. • Current density limits for copper busbars, such as 2A/mm² for currents up to 1600A. • The critical function and application of Residual Current Devices (RCDs).	
	VC 8035 Compulsory specification for earth leakage protection units.		SANS 60439-1 / IEC 60439-1 Standard for low-voltage switchgear and control gear assemblies.		

NotebookLM

The Business of Engineering: Commercial Acumen and Client Engagement

Successfully translating engineering expertise into commercial services, including formal project billing and participation in the industrial supply chain.

Supply Chain Participation

- Quote Request Submitted to MPC for 10 serialized parts for the Energy industry.

Financial Management

Actively managed via Xero accounting software.



INVOICE	
Invoice Number: INV-0004	Date: 27 Jul 2023
Billed To: Shoprite (mmsale@shoprite.co.za)	
Services Rendered	
✓ Business Engineering	
✓ Marketing Engineering	
Total Amount: ZAR 100,920.00	

NotebookLM

Navigating the Professional and Regulatory Ecosystem

Effective engineering practice requires critical engagement within a complex ecosystem of government bodies, professional associations, and regulatory frameworks.

Analysis of Stakeholders Consulted for Final Verification

56

Total Participants

Representative stakeholder categories:

- Workplace Practitioners
- Professional/Regulatory Bodies
- Employer/Employee Associations
- Public & Private Education Providers
- Curriculum Development Specialists

National Treasury Engagement

Submission of SBD 8 & SBD 9 bidding documents via the Central Supplier Database (CSD).



national treasury
Department:
National Treasury
REPUBLIC OF SOUTH AFRICA

Professional Association Interaction

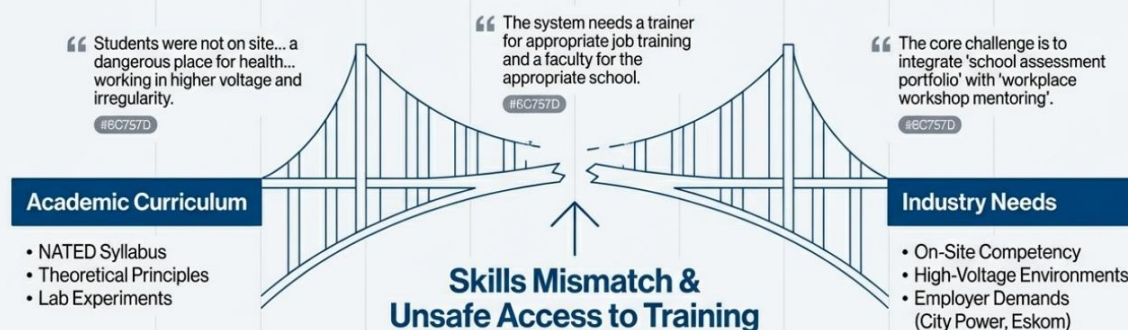
Active interaction and mediation with the Electrical Conformance Board (ECB) of South Africa.



NotebookLM

Identifying a Systemic Challenge: Bridging the Gap Between Education and Industry

A critical disconnect exists between theoretical engineering curricula and the practical, on-site realities of the South African energy sector. Students face significant barriers to gaining meaningful work experience in high-stakes environments with employers like City Power and Eskom.



NotebookLM

A Blueprint for Innovation: A Proposed Framework for Engineering Education and Industry Integration

A formal research project submitted to the Eskom Expo for Young Scientists, presenting a concrete framework to address the identified skills gap.

Implementation Framework Policy for College and School Engineering Circular Assessment in Entrepreneurship and Industry Society Commissioning and Government Municipality Team Training Work

• Aim

To review and reform the system of learner induction and career transition, creating a standardized, synchronized framework between educational institutions (St Peace College) and industry partners (City Power, Eskom).

• Research Questions

How can the transition phase for learners be optimized to resolve the mismatch between junior graduate capabilities and the demands of industry, considering human resources, material capacity, and project tenders?

• Engineering Goals

To design and facilitate an updated learner entry model (N1-N6) that aligns with current industry job requirements and creates a clear, efficient pipeline from education to employment.

• Methodology

Utilize a toolkit of log books, databases, panel systems, and assessment rubrics. Implement a process of stakeholder synchronization, data collection, and both formative and summative assessments to monitor the framework's efficacy.

📖 NotebookLM

Neue Haas Grotesk Display Pro Bold

A Vision for a Technologically Advanced and Sustainable Energy Future

Source Serif Pro Regular

Solving the skills gap is the foundational step towards addressing South Africa's broader energy challenges and embracing the Fourth Industrial Revolution (4IR).

Neue Haas Grotesk Display Pro Medium

Energy Generation & Sustainability



Key point

City Power's strategic exploration of engaging Independent Power Producers (IPPs).

Proposed 27.5 MW solar PV system

7.2 MWh Lithium-Ion storage

9.32%
ROI

7-Year
Payback Period

Research Focus

Nanotechnology for improved solar panels and safer mining.

Source Serif Pro Italic

Neue Haas Grotesk Display Pro Medium

Fourth Industrial Revolution (4IR) Skills



Key point

Full-time development program for unemployed youth.

Targeted Technologies

Certifications

Robotics

Cisco IT

Coding (C++, Python)

CCNA Security

IoT

Linux

3D Design

Neue Haas Grotesk Display Pro Medium

Smart Infrastructure



Key point

Eskom's smart prepaid meter program to empower consumers and improve grid reliability.

Development Focus

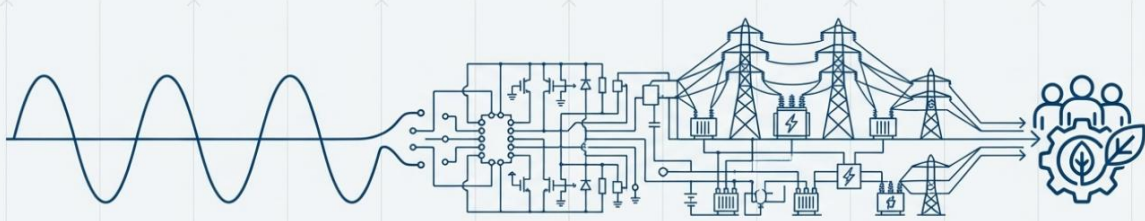
Advanced metering approaches and complex energy systems monitoring.

Source Serif Pro Italic

📖 NotebookLM

The Complete Engineer: From Component to System, from Science to Society

The journey begins with the fundamental laws of physics, is forged through hands-on practice and professional engagement, and culminates in the ability to analyze, critique, and innovate at a systemic level—connecting technical proficiency with a clear and vital purpose.



- › “Science is the study of the nature and behaviour of natural thing... engineering common for Latin word ingenieure v. means to design... successful engineering must improve the quality of life.”

NotebookLM

From Theory to Impact: The Professional Profile of Fiston Tshingombe Tshitadi

An Engineering Innovator Bridging Academics, Application, and Entrepreneurship

Academics

Application

Entrepreneurship



NotebookLM

A Synthesis of Engineering Excellence

This portfolio presents Fiston Tshingombe Tshitadi as a dynamic engineering professional defined by four key pillars: a rigorous academic foundation, deep hands-on technical application, proven entrepreneurial acumen, and a forward-looking vision for systemic industry improvement. Each pillar demonstrates a commitment to bridging the gap between theoretical knowledge and tangible impact.



1. Academic Foundations

Comprehensive NATED and SAQA qualifications in Electrical Engineering.



2. Technical Application

Mastery of core engineering principles and practical skills in diagnostics, design, and implementation.



3. Entrepreneurial Venture

Successful translation of engineering skills into commercial value and business development.



4. Visionary Research

A structured plan to solve the critical disconnect between engineering education and industry demands in South Africa.

NotebookLM

Pillar I: A Rigorous Academic and Aptitude Foundation

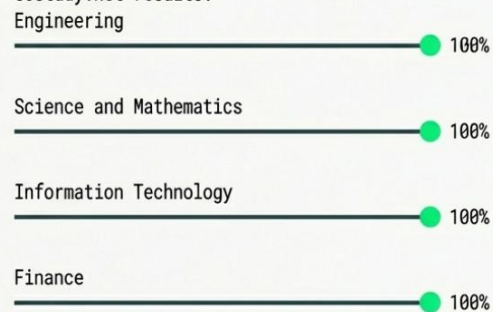
Formal Qualifications

- **National NATED Diplomas (N1-N6) in Electrical Engineering:** A comprehensive vocational education covering foundational to advanced concepts.
- **SAQA Registered Qualifications:** Including National Certificates in Electrical Engineering (e.g., SAQA ID: 67375, 66960).
- **Core Subjects Studied:**
 - Mathematics (N1-N4)
 - Engineering Science (N1-N4)
 - Industrial Electronics (N1-N4)
 - Electrical Trade Theory
 - Electrotechnics & Electrotechnology
 - Power Machines
 - Engineering Drawing

Career Aptitude Assessment

Validated Aptitude for Technical and Scientific Fields.

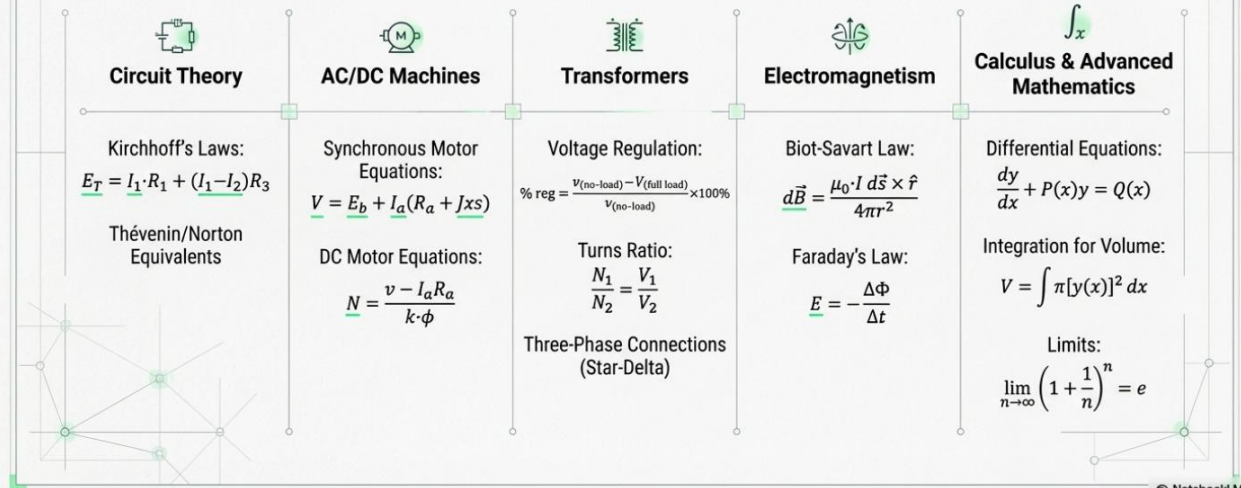
GoStudy.net results:



NotebookLM

Pillar II: Mastery of Core Engineering Principles

A profound understanding of the mathematical and physical laws governing electrical systems is the bedrock of effective engineering. This selection of applied formulae demonstrates mastery across key domains.

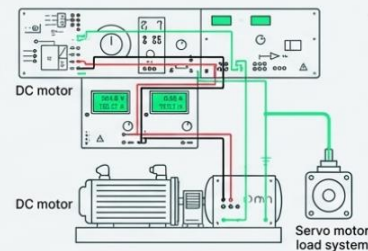


NotebookLM

From the Lab to the Field: Applied Technical Expertise

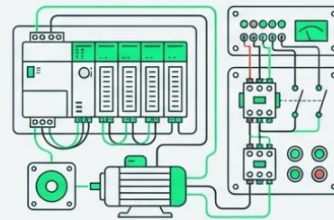
Practical Skills & Diagnostics

- **Motor Rewinding:** Detailed process knowledge, including stator analysis (e.g., 'number of stator gaps $z=24$ ', 'width of slot $b_1=6,621\text{mm}$ ').
- **Fault Finding & Protection:** Expertise in control circuits, protective devices, fault discrimination, and compliance with installation rules (PVC, flexible conduit).
- **Installation & Compliance:** Deep familiarity with SABS/SANS standards (e.g., SANS 10142) for electrical installations, including distribution boards, circuit breakers, and earth leakage protection.



Laboratory & Didactic Experience

- **Hands-on Training:** Experience with advanced didactic training systems for electrotechnology, PLC, and motor control.
- **Key Experiments:**
 - Determination of Efficiency and Voltage Regulation of a single-phase Transformer by direct loading.
 - DC Shunt-Wound Motor 'Load characteristic' setup.
 - Power electronics labs using modular Lab-Volt and DSPACE equipment.



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Specialized Knowledge in Power System Design and Analysis



Substation Design & Calculation

- System Planning & Short Circuit Studies
- Load Flow & Insulation Coordination Studies
- Ground Grid & Lightning Protection Calculation



Protection & Control Systems

- Electrical Protection and Control Analysis
- AC/DC Auxiliary Power Systems & Battery Calculation
- SCADA & Load Management Projects



Generation & Transmission

- Synchronous Generator and Transmission Systems
- Analysis of Symmetrical/Asymmetrical Faults
- Reactive Power Compensation Strategies



Robotics & Automation

- Robot Dynamics, Kinematics, and Control
- Forward Kinematics for Planar Robots
- PLC Programmable Logic and Control

NotebookLM

Pillar III: The Entrepreneurial Drive: Building a Venture

Translating technical expertise into market value is a hallmark of an engineering innovator. The 'Tshingombe' enterprise was established to provide specialized engineering services.

TSHINGOMBE

Formal Business Operations

- **Entity:** Tshingombe
- **Services:** Business Engineering, Marketing Engineering, Technical Consulting.
- **Systems:** Utilizes professional business management software including Xero and QuickBooks for invoicing, accounting, and financial reporting.

Engagement with Public & Private Sector Procurement

- **Government Supplier Registration:** Registered on the National Treasury's Central Supplier Database (CSD), enabling formal engagement with government tenders.
- **Formal Bidding:** Actively participates in procurement processes, demonstrated by the completion and submission of Standard Bidding Documents (SBD 8 & SBD 9).
- **Proactive Business Development:** Engages with potential clients for specialized components, evidenced by a quote request to Metalphoto of Cincinnati for serialized parts for the Energy industry.



NotebookLM

Proof of Commercial Acumen: Delivering High-Value Engineering Services

INVOICE NUMBER: INV-0004

CLIENT: mmsale@shoprite.co.za DATE: 27 July 2023

ZAR 100,920.00

Business Engineering (5 Units @ ZAR 20,000.00)
Marketing Engineering (2 Units @ ZAR 400.00)

This project demonstrates the ability to scope, price, and deliver substantial engineering consulting services to a major commercial client, managing the entire process from engagement to invoicing.

Pillar IV: Identifying a Critical Gap in South African Engineering

Educational Institutions (Theory)



Industrial Employers (Practice)



The Central Problem

A significant disconnect exists between the theoretical knowledge provided by educational institutions (Colleges, NATED programs) and the practical, integrated skills required by key industrial employers like City Power and Eskom.

Direct Observations & Analysis

“Student was alone... no company tendered work partners with city power Eskom on visiting site.”

“Student was not in site... was dangerous place for health... working in higher voltage and irregularity...”

“System need to trainer training appropriate job and faculty appropriate school.”

Conclusion: There is a systemic failure to integrate students into the workplace, posing risks and limiting skills development, which ultimately hinders the talent pipeline for national utilities.

A Vision for Systemic Change: A National Research Proposal

Section 1: The Proposal

Project Submission

A formal research plan developed for the **Eskom Expo for Young Scientists**.

Distilled Project Goal

To create and implement a national framework that aligns engineering curricula, assessment policies, and technological education with the real-world operational needs of industry, ensuring a seamless transition for graduates into the workplace.

Section 2: Key Focus Areas

Bridging the gap between DHET/SAQA qualifications and industry requirements (City Power, Eskom).

Integrating practical, on-site training and mentorship.

Developing standardized assessment tools (formative, summative, rubrics) for both academic and workplace learning.

Leveraging educational technology to enhance skills transfer.

The Research Framework: A Blueprint for Integration

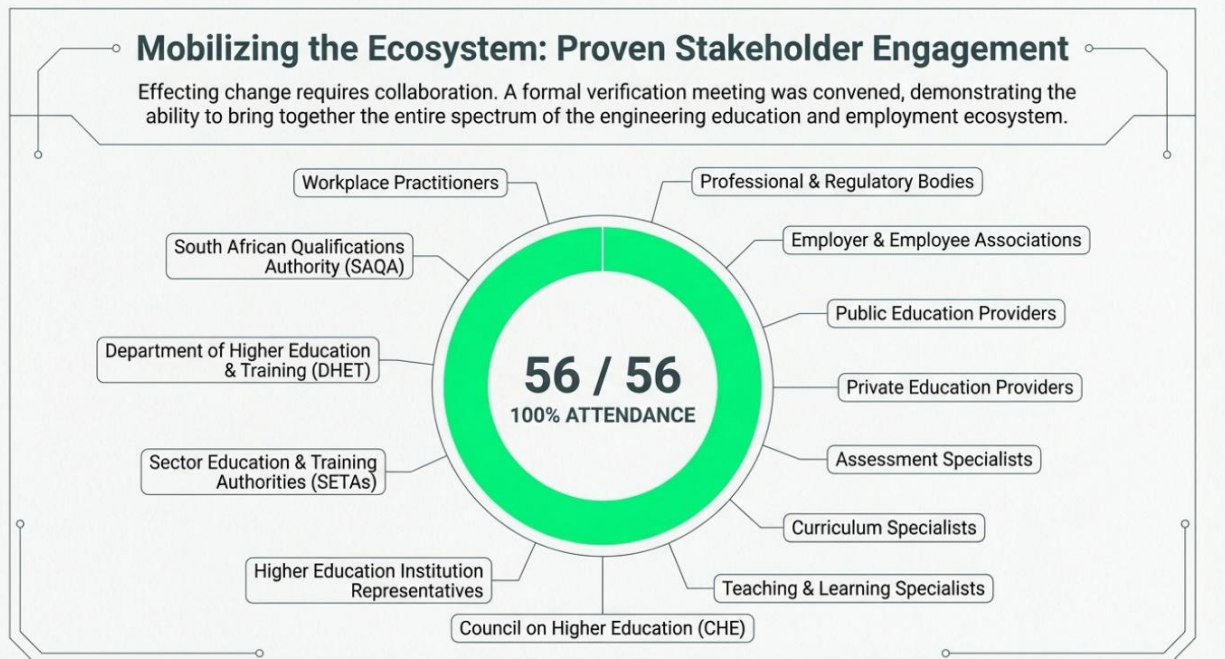
A structured approach to analyze the current system, design a new integrated model, and implement it through stakeholder collaboration.

Key Project Activities & Objectives

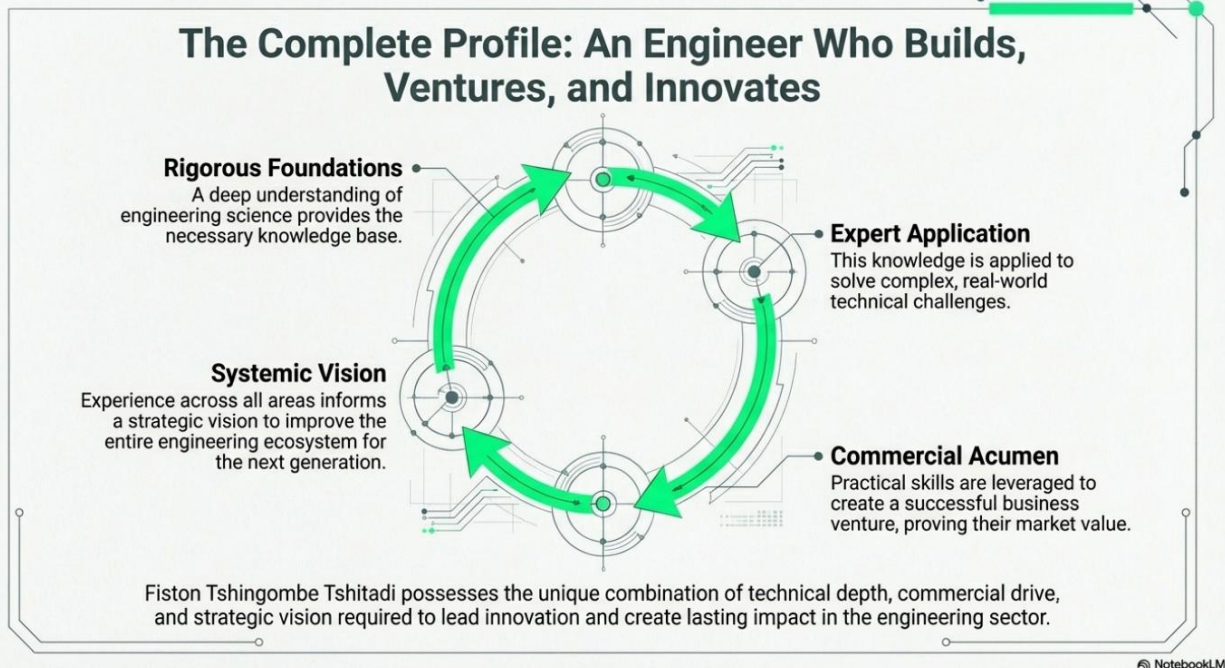
Objective	Activity	Budgeted Cost
Objective 1: Curriculum & Policy Assessment	Engineering electrical assessment curriculum policy.	ZAR 50,000
	Electrical portfolio review.	ZAR 50,000
	Total Objective 1: ZAR 100,000	
Objective 2: Learner & Study Assessment	Engineering studies assessment.	ZAR 50,000
		ZAR 50,000
	Total Objective 2: ZAR 100,000	

Core Method

- The project will utilize a systematic process including learner pipeline management, material development, workplace site analysis, and robust monitoring & evaluation mechanisms to ensure project objectives are met.



NotebookLM



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Contact & Professional Details

Fiston Tshingombe Tshitadi

Email: tshingombekb@gmail.com

Location: Johannesburg,
Gauteng, South Africa

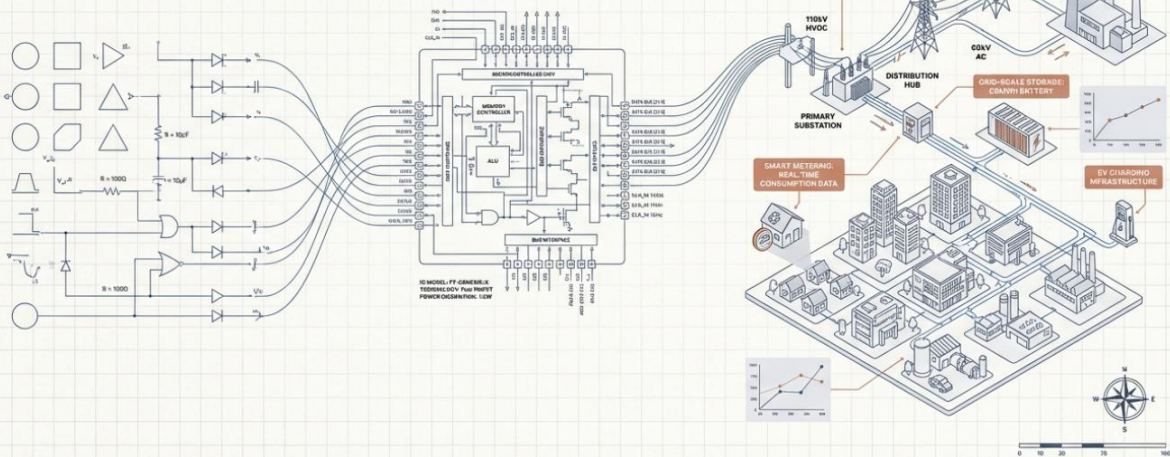
Key Competencies

- Electrical Engineering (NATED / SAQA)
- Power Systems Analysis & Design
- Entrepreneurship & Business Management
- Educational Framework & Curriculum Development

NotebookLM

Forging an Engineer: A Journey from Core Principles to Systemic Innovation

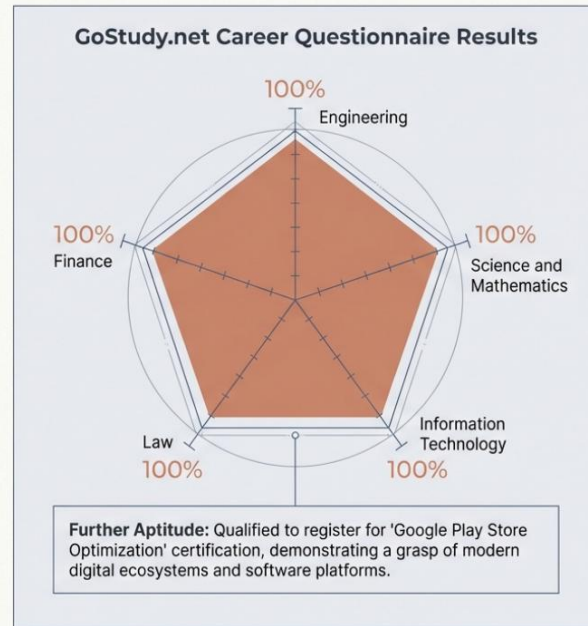
The Portfolio of Fiston Tshingombe Tshitadi



NotebookLM

An Innate Aptitude for Engineering and Technology

A successful engineering career begins with a natural inclination towards analytical, systemic, and technical fields. An initial career assessment provides an objective data point, revealing a strong, pre-existing alignment with core engineering and technology disciplines.



NotebookLM

Mastering the Language of Engineering: Core Scientific Principles

This slide distills a vast array of technical formulas into key conceptual domains, representing a structured and comprehensive foundation of theoretical knowledge.

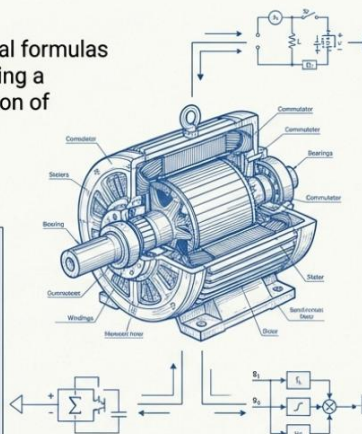
Power Systems & Machines

Synchronous Motor Equations:
 $V = E_b + I_a(R_a + jX_s)$

Synchronous Speed:
 $N_s = 120f/p$

Power Factor Calculation:
 $\tan \Phi = \sqrt{3}(P_2 - P_1) \div (P_2 + P_1)$

Efficiency:
 $\text{Eff} = \frac{\text{useful energy or work out}}{\text{total energy input}}$



Circuit Analysis & Electromagnetism

Kirchhoff's & Norton's theorems:

$$E_T = I_1 R_1 + (I_1 - I_2) R_3$$

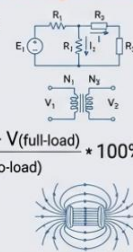
Transformer Equations:

$$N_1 \div N_2 = V_1 \div V_2$$

$$\% \text{ Regulation} = \frac{V(\text{no-load}) - V(\text{full-load})}{V(\text{no-load})} \times 100\%$$

Biot-Savart Law:

$$dB = (\mu_0 \times I) \times \frac{\mu_0 \times I \times ds \times r}{4 \times \pi \times r^2}$$



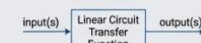
Control Systems & Signal Processing

Fourier Transforms:

$$TF(S_t)$$

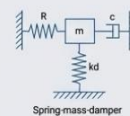


Filtre lineare box:



Laplace Transforms & System Stability:
 $L \cdot \frac{di}{dt} + Ri = E \cos(\omega t)$

Robotics & Kinematics:
 $m\ddot{x} + c\dot{x} + kx = f(t)$

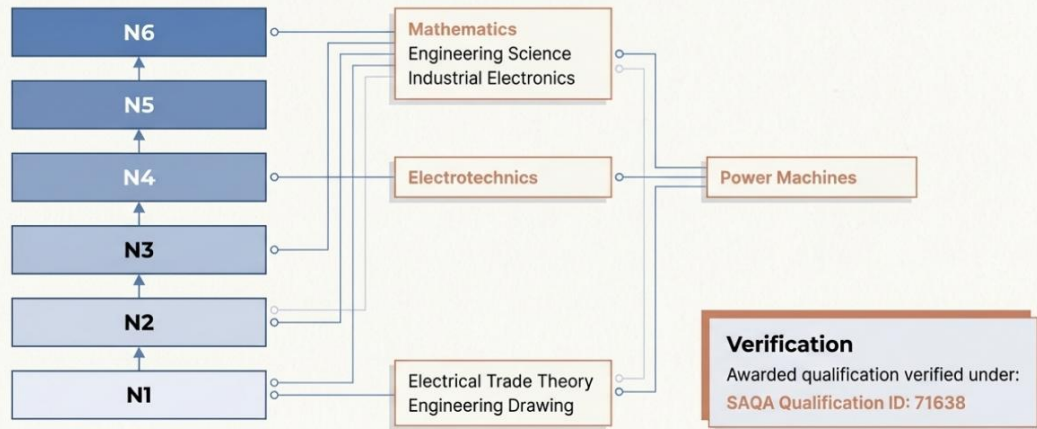


NotebookLM

A Structured Ascent Through National Engineering Qualifications

The progression through South Africa's N-Level qualifications (NATED) provides a standardized, multi-level pathway to an engineering diploma, governed by bodies like DHET, SAQA, and QCTO.

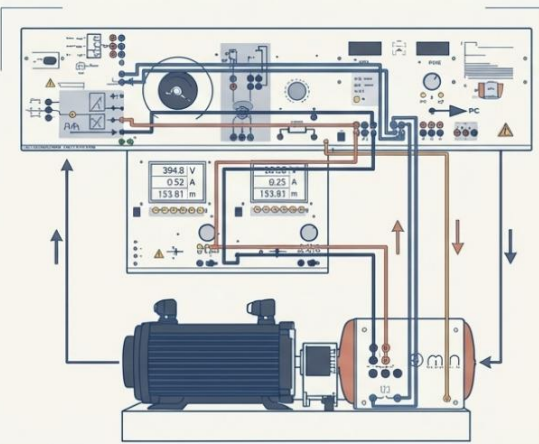
NATED Curriculum Progression (N1-N6)



NotebookLM

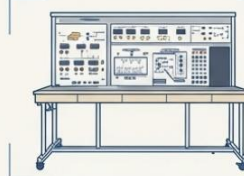
From Blueprint to Reality: Applied Skills in the Engineering Laboratory

Hands-on training using industry-standard didactic systems bridges the gap between theoretical principles and practical, real-world application.



Key Experiments & Skills

- **Motor Analysis:** Setup for DC shunt-wound motor 'Load characteristic' test, including measuring armature voltage/current and subjecting the motor to a load.
- **Component Craftsmanship:** Detailed motor rewinding process, from winding removal to soldering, insulation, and final testing.
- **Power Electronics:** Experiments with Boost Converters and PWM inverters using DSPACE and Power-Pole test benches.
- **Transformer Testing:** Determination of efficiency and voltage regulation of single-phase transformers via direct loading.



NotebookLM

Engineering with Integrity: Adherence to National Safety and Installation Standards

Safe, reliable electrical installations are non-negotiable. All practical work is governed by a strict framework of compulsory national standards and safety regulations.

Key Standards Cited

SANS 10142 (SABS 0142)

The core standard ensuring the basic safety of electrical installations.

VC 8036

Compulsory specification for circuit breakers.

VC 8035

Compulsory specification for earth leakage protection units.

SANS 60439-1 / IEC 60439-1

Standard for low-voltage switchgear and control gear assemblies.

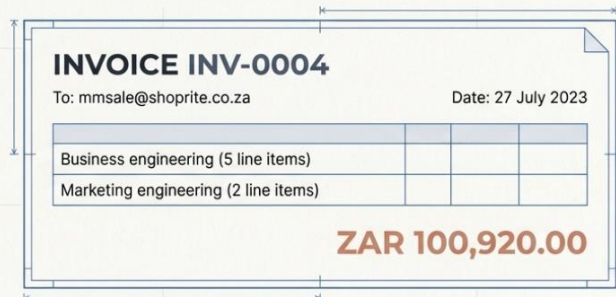
Applied Safety Principles

- **Protective conductor** requirements for new installations.
- Rules for Distribution Board mounting, access, and labeling.
- Current density limits for copper busbars (e.g., 2A/mm² for currents up to 1600A).
- Function and application of RCDs (Residual Current Devices).

NotebookLM

The Business of Engineering: Commercial Acumen and Client Engagement

Demonstrating the ability to translate engineering expertise into commercial services, including project billing, client management, and supply chain participation.



INVOICE INV-0004

To: mmsale@shoprite.co.za Date: 27 July 2023

Description	Quantity	Unit Price	Total
Business engineering (5 line items)			
Marketing engineering (2 line items)			

ZAR 100,920.00



MPC Web Quote Request

Part Number:

Quantity:

Industry:

Supplier:

MPC Web Quote Request

Request for quotation submitted for 10 serialized parts for the Energy industry, demonstrating engagement with industrial suppliers.



Xero Accounting

Dashboard

Chart: New

Reporting

Reporting date

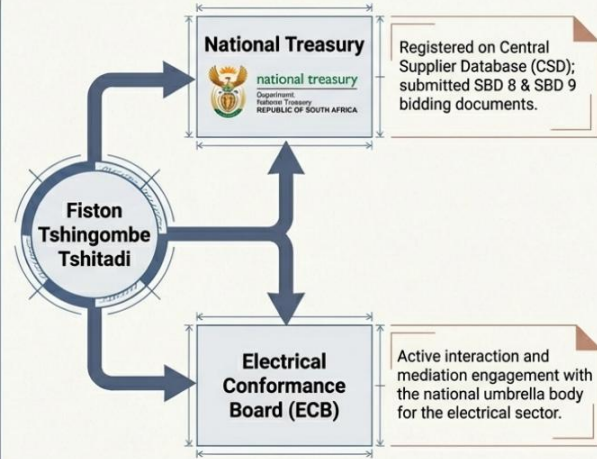
NotebookLM

Navigating the Professional and Regulatory Ecosystem

Effective engineering practice requires critical engagement within a complex ecosystem of government bodies, professional associations, and regulatory frameworks.

Analysis of Stakeholders Consulted for Final Verification

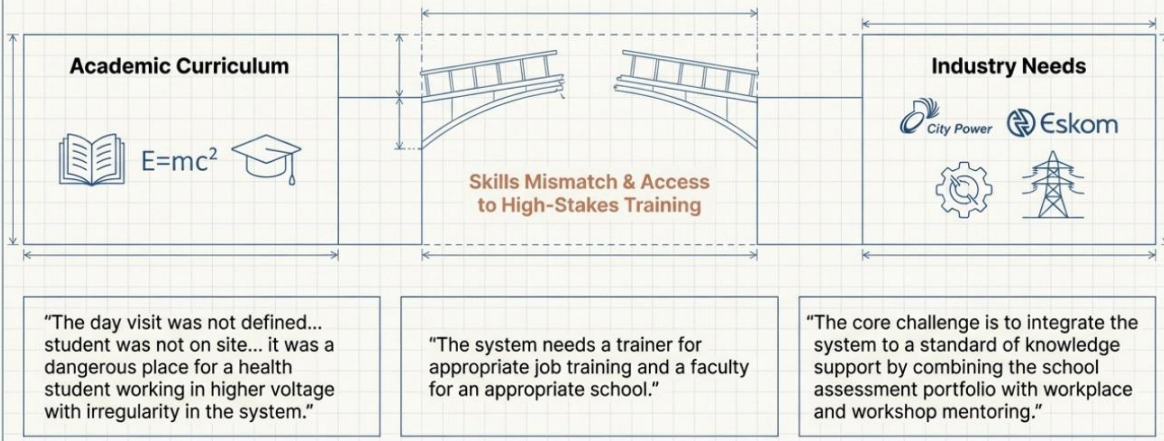
Classification	Participants
Workplace Practitioners	4
Professional/Regulatory Bodies	4
Employer/Employee Associations	4
Education and Training Providers (Public & Private)	4
Curriculum Development Specialists	4
Total Participants Consulted	56



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Identifying a Systemic Challenge: Bridging the Gap Between Education and Industry

A critical disconnect exists between the formal engineering curriculum and the practical, on-site realities faced by major employers. Students struggle to gain meaningful work experience in high-stakes environments, creating a systemic skills gap.



NotebookLM

A Blueprint for Innovation: A Proposed Framework for Engineering Education and Industry Integration

A formal research project submitted to the "Eskom Expo for Young Scientists" proposing a concrete, data-driven solution to bridge the education-industry gap.

Implementation Framework Policy for College and School Engineering Circular Assessment in Entrepreneurship and Industry Society Commissioning, and Government Municipality Team Training for Graduate Engineering Work Timeframes.

AIM

To review and reform the system of learner induction and career transition, creating a standardized, synchronized framework between educational institutions (e.g., St Peace College) and industry partners (e.g., City Power, Eskom).



RESEARCH QUESTIONS

To analyze factors affecting job career outcomes and the transition phase for learners. How can a college cadet function as a graduate to resolve demand factors in human resources, tendered bids, and material capacity integration?



ENGINEERING GOALS

To design and facilitate an updated learner entry model (N1-N6, NQF levels) that aligns with current industry job requirements and creates a clear, measurable pipeline from education to employment.



METHODOLOGY

Utilize specific tools (log books, databases, panel systems, assessment rubrics) and processes (stakeholder synchronization, data collection, formative & summative assessments) to implement, monitor, and validate the framework.



NotebookLM

A Vision for a Technologically Advanced and Sustainable Energy Future

Solving the skills gap is the foundational step toward addressing South Africa's broader energy challenges and embracing the opportunities of the Fourth Industrial Revolution (4IR).



Energy Generation & Sustainability

- City Power exploring engagement with **Independent Power Producers (IPPs)** to diversify energy sources.
- Analysis of a **27.5 MW solar PV system** with **7.2 MWh Li-Ion storage**, noting a **9.32% ROI** and 7-year payback period.
- Research into **nanotechnology** for building superior solar panels and enhancing mining safety.



Fourth Industrial Revolution (4IR) Skills

- Focus on developing critical skills in **robotics, coding (C++, Python), IoT, and 3D design**.
- Full-time development program for unemployed youth covering **Cisco IT, CCNA Security, and Linux**.



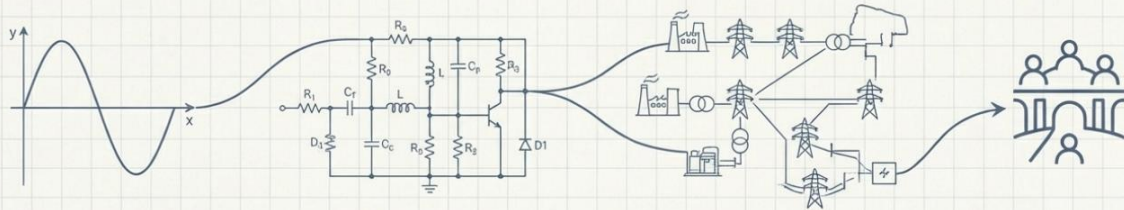
Smart Infrastructure

- Eskom's **smart prepaid meter program** to empower consumers and improve grid reliability.
- Development of **advanced metering approaches** and monitoring for complex energy systems.

NotebookLM

The Complete Engineer: From Component to System, from Science to Society

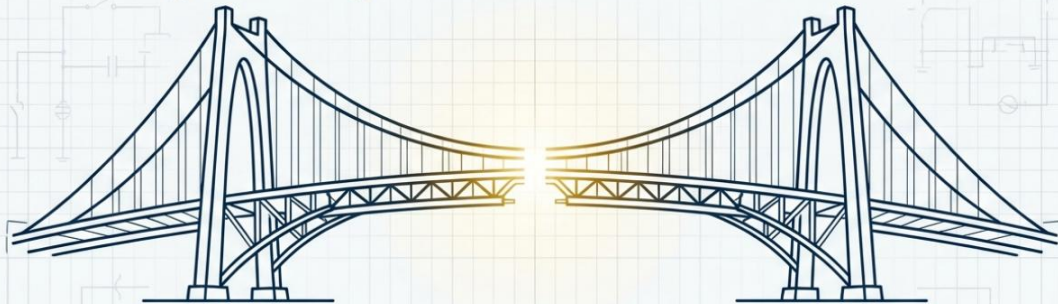
The journey begins with the fundamental laws of physics, is forged through hands-on practice and professional engagement, and culminates in the ability to analyze, critique, and innovate at a systemic level—connecting technical proficiency with a greater purpose.



“Science is the study of the nature and behaviour of natural things... **engineering** comes from the Latin word ‘**ingeniere**’ which means **to design**... successful engineering must **improve the quality of life**.”

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From Theory to Trade: A New Framework for Engineering Excellence in South Africa



Bridging the critical gap between technical education and industry demands to build a competent, safe, and innovative workforce.

Presented by Fiston Tshingombe Tshitadi

NotebookLM

The Challenge and The Opportunity



The Problem

A dangerous disconnect exists between South Africa's NATED-based theoretical engineering education and the practical skills required by industry and SAQA/QCTO occupational qualifications.



The Solution

An integrated framework that linearizes curriculum, embeds structured work-based learning with partners like **City Power and Eskom**, and creates a clear, unified pathway to trade certification.

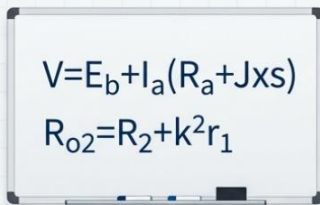


The Outcome

A pipeline of **skilled artisans**, **enhanced industrial safety and productivity**, **reduced skills mismatch**, and a **stronger national energy and infrastructure sector**.

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The Unique Expertise to Build the Bridge



The Engineer

Deep, hands-on expertise in Electrical Engineering, from fundamental principles to complex industrial applications.



The Educator & Systems Analyst

In-depth knowledge of South Africa's educational and qualifications labyrinth, including DHET, SAQA, QCTO, and ECSA frameworks.

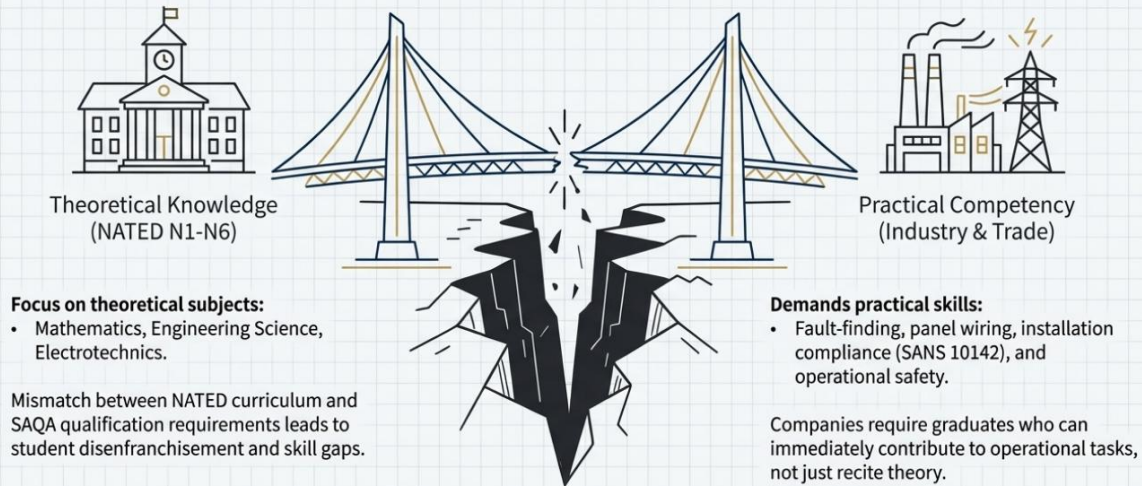


The Entrepreneur

Proven experience in business engineering, project management, and delivering value to industrial clients.

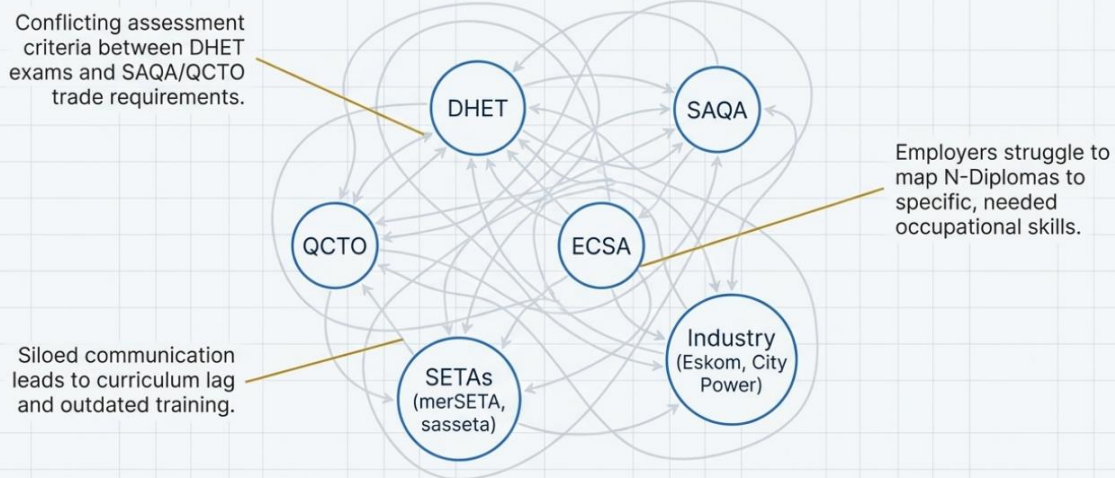
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A System Divided: The Gap Between College and Career The Gap Between College and Career



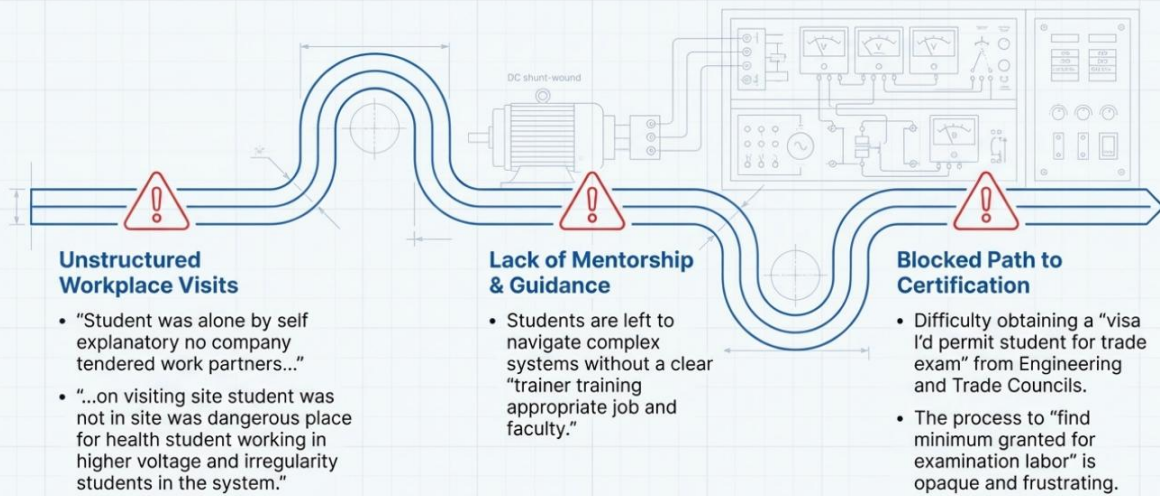
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The Fragmented Landscape of Technical Qualifications



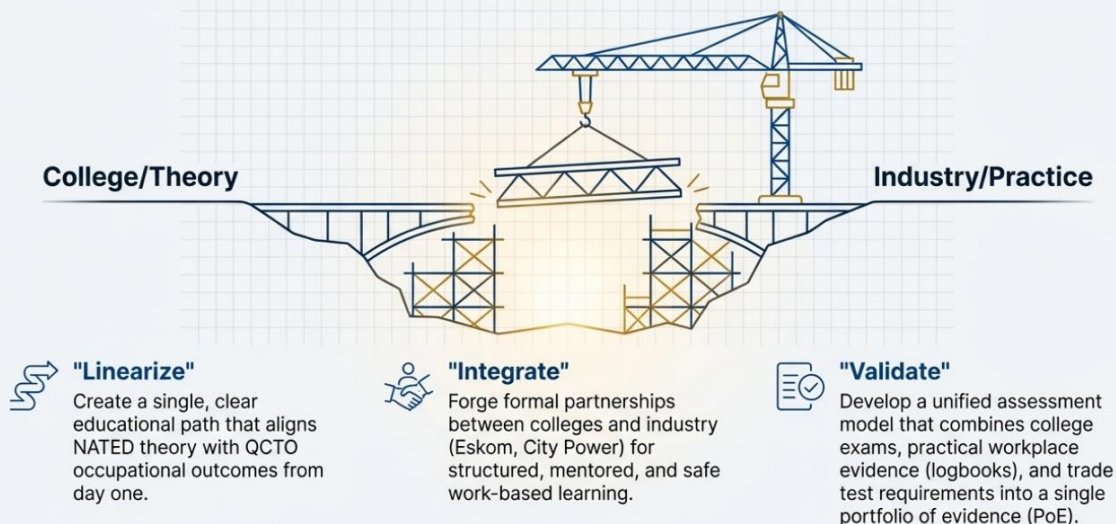
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The Student's Ordeal: A Journey Without a Bridge



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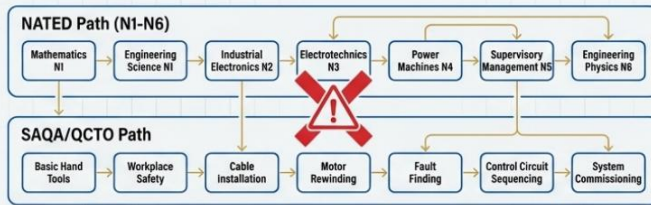
The Solution: An Integrated Framework for Competency



NotebookLM

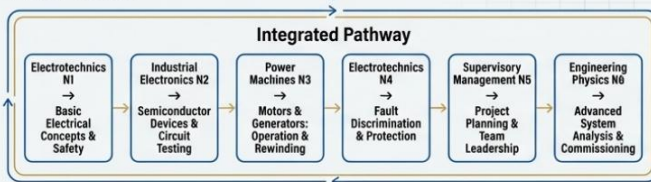
Pillar 1: Linearizing the Curriculum from N1 to Trade Test

Before State



Curriculum Mapping & Integration

After State



Key Actions

• Curriculum Mapping

Directly map NATED subjects like *Industrial Electronics*, *Electrotechnics*, and *Power Machines* to specific QCTO occupational tasks such as *motor rewinding*, *fault finding*, and *control circuit sequencing*.

• Integrating Foundational & Practical Logic

Combine theoretical formulas (e.g., $\text{Lim } \frac{-b \pm \sqrt{b^2 + 4ac}}{2a}$, Kirchhoff's laws) with their direct application in 'operational plant mathematics' and 'fault discrimination.'

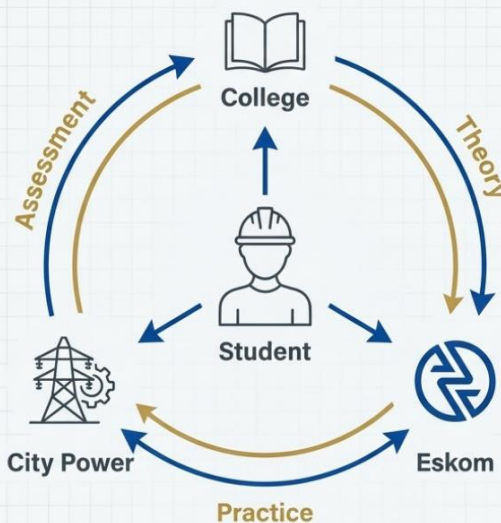
• Standardized Didactic Materials

Develop unified textbooks, lab manuals, and assessment rubrics that are co-authored by lecturers and industry practitioners.



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Pillar 2: Forging Meaningful Industry Partnerships



Partnership Model

• Structured Internships

Replace ad-hoc site visits with 24-month registered apprenticeships where students rotate through key departments (e.g., Metering, Substation Maintenance, Generation).

• Industry Mentors

Assign each student a registered workplace practitioner responsible for signing off on a logbook of completed duties.

• On-Site Training Centers

Establish 'school collie Eskom commission' or 'power city in school development plant' facilities where students learn on the same equipment they will use in the field, ensuring safety and relevance.

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Pillar 3: A Unified Portfolio for Seamless Certification

The Integrated Portfolio of Evidence (PoE) will include:

- **Academic Transcripts**
Verified results for N1-N6 subjects from DHET.
- **Workplace Logbook**
Signed-off evidence of practical competencies and completed tasks from industry mentors at City Power/Eskom.
- **Formative & Summative Assessments**
Standardized practical lab tests and projects ('ISAT') co-designed with industry.
- **Trade Test Readiness**
The completed PoE serves as the direct application and 'permit' for the final trade test, eliminating bureaucratic hurdles.



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Ready for Implementation: A Practical Project Plan

Project Objective	Main Activities	Outputs/M&E	Responsible Person	Estimated Costs
1: Curriculum Alignment	Engineering electrical assessment curriculum policy	2 Modules defined	Tshingombe Tshitadi	ZAR 50,000
	Develop integrated portfolio framework	12 Portfolio sections	Tshingombe Tshitadi	ZAR 50,000
2: Pilot Program Setup	Engineering studies assessment with partners	12 Student placements	Tshingombe Tshitadi	ZAR 50,000

This is not just an idea; it is a fully-costed project plan ready for submission and execution. It demonstrates an understanding of official processes for 'Monitoring and Evaluation (M&E)', 'Timeframes,' and 'Detailed Costs.'

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A Phased Roadmap to National Impact



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Seeking Partners to Build the Future of Engineering

The Ask

We are seeking foundational partners from government, industry, and academia to launch the pilot phase of this transformative framework.

Next Steps

- Schedule a follow-up meeting to discuss the detailed implementation plan.
- Form a joint steering committee to oversee the pilot program.
- Secure seed funding to cover the initial project objectives outlined.

ANNEXURE J: PARTNERSHIP STATEMENT

Partner Organization	Representative	Signature
Project Lead/Initiator Example foundational partners from government, industry, and academia to launch the pilot phase of this transformative framework. Example: Medium Grey Initiator (#6C757D)	Partner 1	Partner 2
	Organization Name	Organization Name
	Representative Name	Representative Name
	Date	Date
	Signature	Signature

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The Result: A Stronger Nation Through Skilled Hands



For Students

A clear path to a valuable, in-demand career.

For Industry

A reliable supply of competent, work-ready artisans, leading to higher quality, safer operations, and increased innovation.

For South Africa

A strengthened infrastructure, a more competitive economy, and the successful integration of youth into the Fourth Industrial Revolution.

**"Every work done to perfection is done twice: once planned, once actual.
The plan is complete. *It is time to build.*"**

 NotebookLM

A Journey in Electrical Engineering: From Theory to Practice

EDUCATIONAL FRAMEWORK & QUALIFICATIONS

Mastery of the National Engineering Curriculum

Experience spans NATED qualifications (NT-N6) and the National Qualifications Framework (NQF).

EXTENSIVE STAKEHOLDER ENGAGEMENT

Final verification meeting included 39 participants across 13 professional and educational categories.



Stakeholder Classification	Invited	Attended
Workplace Practitioner	4	4
Professional Body	4	4
Education & Training Provider (Public & Private)	8	8

• Purpose: To highlight the breadth of professional consultation for curriculum development, showing full participation from key sectors. •

Research Focus: Bridging Education and Industry

Developed a research plan for a framework linking college training with industry needs.



TECHNICAL EXPERTISE & APPLICATION



Core Technical & Didactic Knowledge

Expertise in Electrotechnics, Industrial Electronics, Mathematics, and critical safety standards like SANS 10142.



Practical Project Implementation

Engagement with industry leaders like City Power and Eskom through training and site visits.

**ZAR 100,920.00
INVOICED FOR SERVICES**



Billed for professional services including:

- Business engineering
- Marketing engineering

A Profile in Electrical Engineering: Theory, Practice, and Innovation

ACADEMIC & FOUNDATIONAL KNOWLEDGE



National Diploma Pathway in Electrical Engineering
Completed N1-N6 subjects including Mathematics, Engineering Science, Electrotechnics, and Industrial Electronics.



High Aptitude for Technical Fields
Career assessment shows 100% match for Information Technology, Science, and Engineering.



Broad Subject Matter Expertise
Mastery of diverse topics including power machines, logic control, and panel wiring.

PRACTICAL APPLICATION & PROFESSIONAL EXPERIENCE

Gained Practical Experience with Industry Leaders
Involved in training and site visits with key entities like City Power and Eskom.



Developed Technical Frameworks and Research Plans
Authored a project to implement a new engineering curriculum and assessment policy.



Authored a project to implement a new engineering curriculum and assessment policy.



Provided Professional Engineering Consulting Services
Invoiced ZAR 100,920 for business and marketing engineering projects.

Electrical Engineering Expertise: A Profile of Skills & Qualifications



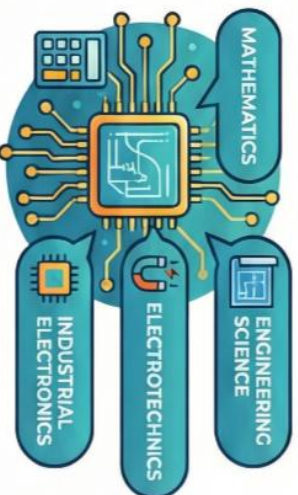
FOUNDATIONAL EXPERTISE & QUALIFICATIONS



CERTIFIED IN NATED ELECTRICAL ENGINEERING (N1-N6)

Aligned with the South African Qualifications Authority (SAQA) NQF framework.

MASTERY OF CORE ENGINEERING PRINCIPLES



KNOWLEDGE OF EDUCATIONAL & QUALITY FRAMEWORKS
Familiar with DHET, QCTO, and SAQA assessment and certification policies.



APPLIED SKILLS & FIELD EXPERIENCE

PRACTICAL EXPERIENCE WITH MAJOR POWER UTILITIES

Involves training, site visits, and project work with entities like City Power and Eskom.



PROFICIENT IN HANDS-ON ELECTRICAL WORK



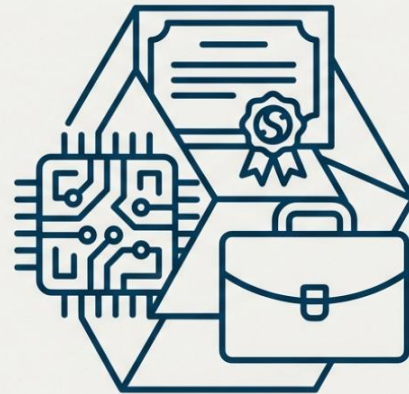
ADHERENCE TO COMPULSORY SAFETY STANDARDS

Compliant with critical regulations like SANS 10142 for electrical installation safety.



The Integrated Competency Framework

A Synthesis of Advanced Engineering Standards, Educational Assessment, and Professional Practice



Tshingombe Tshitadi

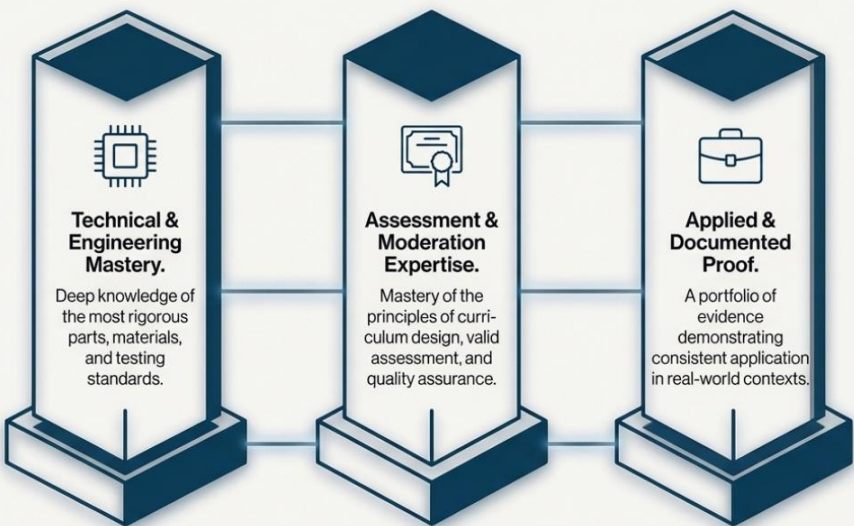
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The Competency Gap: Bridging Technical Standards and Verifiable Skill



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The Solution: An Auditable Framework for Holistic Mastery



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Pillar 1: Mastery of Component Lifecycle and Supply Chain Integrity (MIL-STD-11991B)

Key Concepts

Neue Haas Grotesk Display Pro, 65 Medium

- **Scope:** Management of Parts, Materials, and Processes (PM&P).
- **Core Functions:** COTS Evaluation, Counterfeit Prevention, and Lifecycle Management.
- **Key Principle:** Ensuring reliability, authenticity, and lifecycle management of all components.

Data in Action

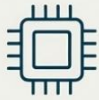
Neue Haas Grotesk Display Pro, 65 Medium

Table 1: PM&P incoming inspection data requirements

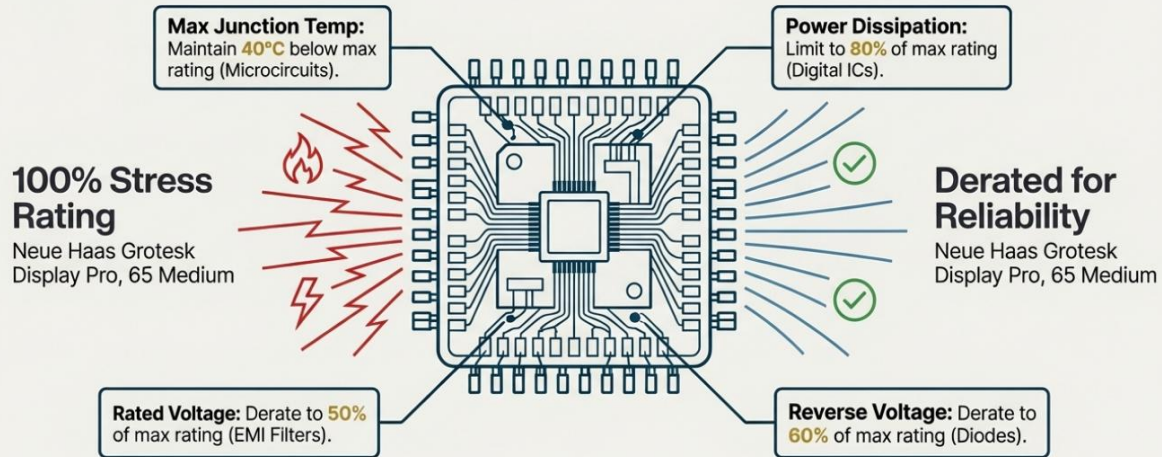
	EEE parts	Mechanical parts	Materials
Database fields maintained for life of program	✓	✓	✓
Certificate of Conformance (C of C)	✓	✓	✓

Critical validation includes non-destructive testing such as **Radiological Inspection (X-ray)** for internal defects and **Particle Impact Noise Detection (PIND)** for detecting loose particles.

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Pillar 1: Engineering for Durability: The Science of Derating



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Pillar 1: Validating Performance Under Extreme Conditions (MIL-STD-202G)

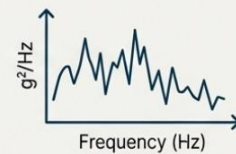
Method 107G: Thermal Shock

Simulates extreme temperature changes from high to low.



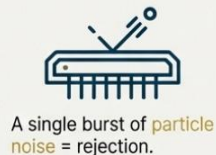
Method 214A: Random Vibration

Ensures survival in operational environments (e.g., aircraft, vehicles).



Method 217A: Particle Impact Noise Detection (PIND)

Detects loose particles inside sealed components that could cause latent failures.



Method 211A: Terminal Strength

Ensures terminals withstand mechanical stress during installation.



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Pillar 2: Expertise in National Qualification Frameworks & Assessment Policy



The Role of an Assessor/Moderator: Ensuring all assessments are **Fair, Valid, Reliable, and Practical**.

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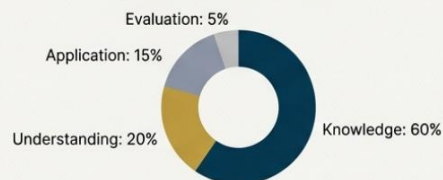
Pillar 2: Engineering the Assessment: Weighting, Cognition, and Structure

Source: Official Syllabus for Electrical Trade Theory N1 (2021)

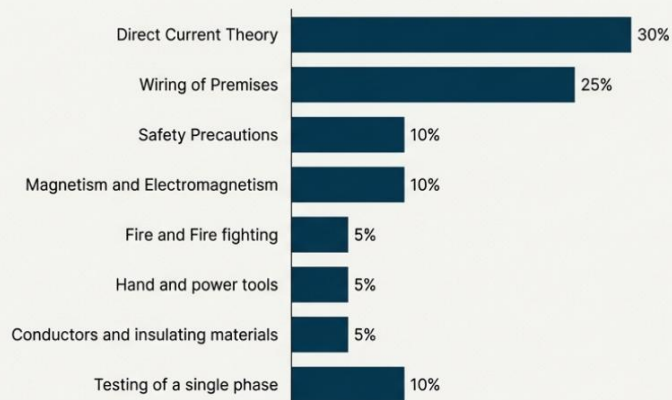
ICASS Weighting



Cognitive Levels (Final Exam)



Module Weighting (%)



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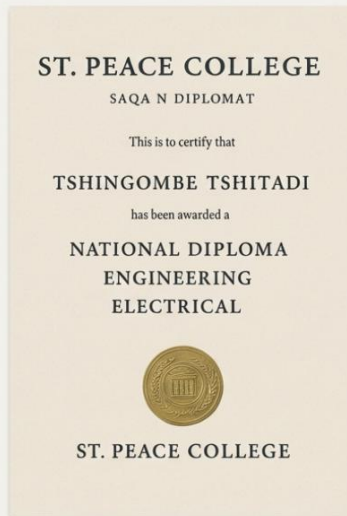


Pillar 3: Verifiable Proof: National N Diploma in Electrical Engineering

Mathematics
N1-N6

Engineering Science
N1-N4

**Electrical Trade
Theory**
N1-N3



Industrial Electronics
N1-N6

Electrotechnics
N4-N6

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Pillar 3: Continuous Development with Industry Leaders



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Pillar 3: Application in High-Stakes Environments in Neue Haas Grotesk Display Pro 65 Medium



Application Role:: Senior Technician (Civil & Electrical)

Relevance: Critical role in national infrastructure, requiring deep knowledge of compliance and technical standards.



SOUTH AFRICAN RESERVE BANK

Application Role: Manager, Security Systems Design and Applications

Relevance: Role demands highest levels of reliability, risk management, and system integrity for national security.

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Pillar 3: Upholding Standards in Professional and Legal Arenas

CCMA & Labour Court

Focus: Unfair Dismissal Claims, Arbitration, Transcript Certiscript Certification.

Evidence: Cites case number GAJB6808-15.

PSIRA Complaint Records

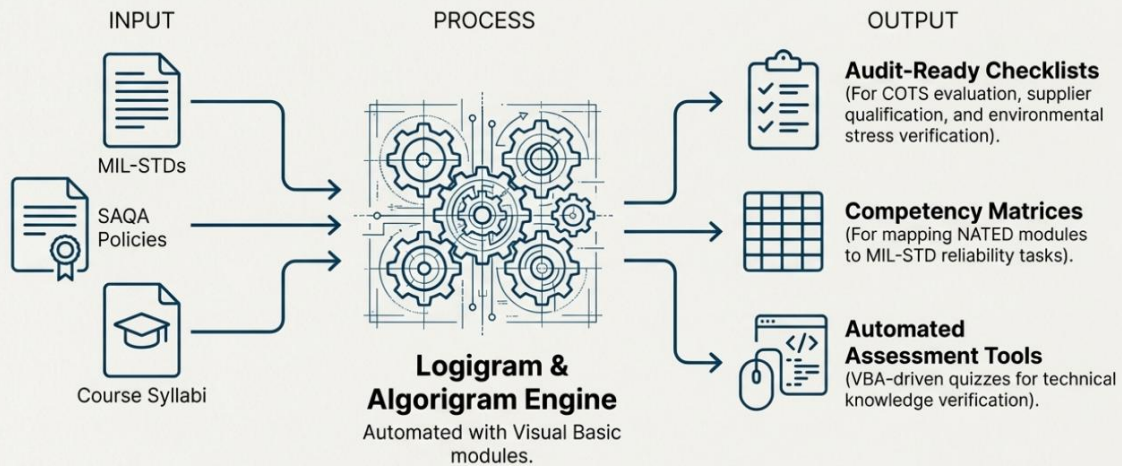
Focus: Upholding Statutory Obligations (e.g., Private Security Sector Provident Fund).

Evidence: Cites failure to remit levy contributions as per Levies Collective Agreement.

Leveraging a deep understanding of compliance and documentation to ensure procedural fairness and uphold regulatory standards.

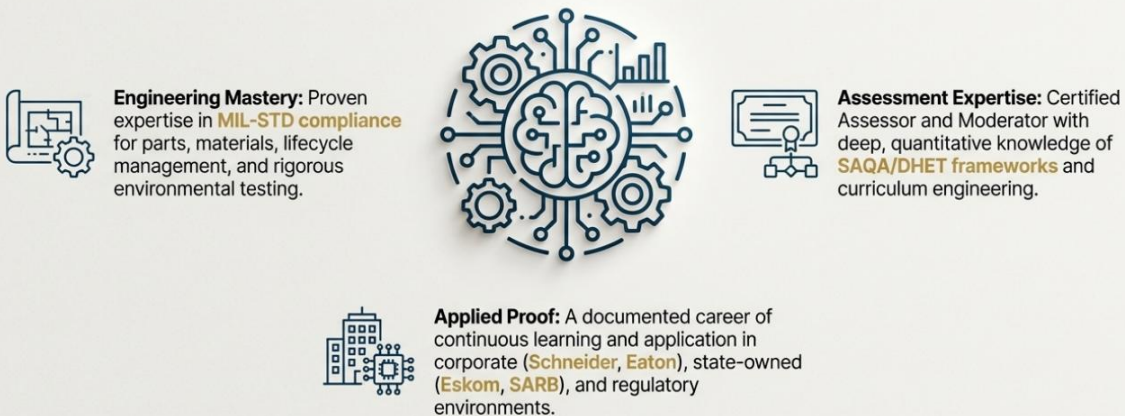
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From Framework to Function: The Operational Toolkit



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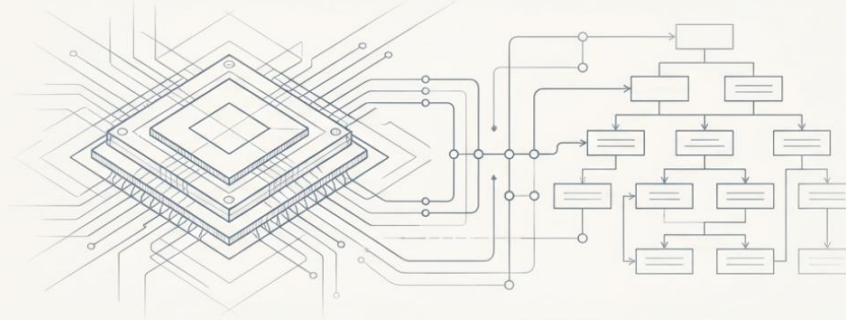
A Unique Profile: Engineer, Educator, and Systems Thinker



NotebookLM

A Systems Approach to Integrating Engineering Standards and Educational Compliance

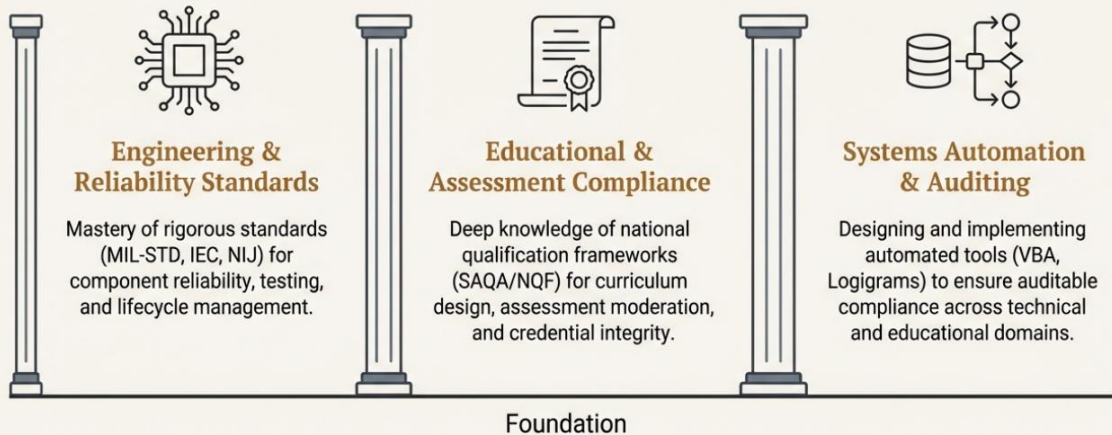
Leveraging deep expertise in military-grade engineering standards and national educational frameworks to build automated, audit-ready systems for quality, reliability, and workforce competence.



Tshingombe Tshitadi
ORCID: 0009-0005-2690-9559

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A Unified Framework Built on Three Pillars of Mastery



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Foundational Expertise Begins with Rigorous Parts, Materials, & Processes (PM&P) Management

Mastery of MIL-STD-11991B provides the bedrock for ensuring reliability and authenticity in military systems. This standard defines the requirements for managing components from development through sustainment.

PM&P Incoming Inspection Data Requirements (MIL-STD-11991B, Appendix H)

Requirement	EEE Parts	Mechanical Parts	Materials	Key Notes
Database Fields Maintained	Yes	Yes	Yes	Lot date code, C of C data
Documented Procedures	Yes	Yes	Yes	Define sampling, methods, criteria
Radiological Inspection	As applicable	Yes	—	Internal defect detection
Destructive Physical Analysis (DPA)	Categories A–B	—	—	Per MIL-STD-1580
Certificate of Conformance (C of C)	Yes	Yes	Yes	Include FTIR, XRF, ASTM tests

Why It Matters

This systematic approach to inspection ensures component traceability and prevents counterfeit parts from entering the supply chain—a principle directly applicable to maintaining the integrity of academic records.

📖 NotebookLM

Component Reliability is Ensured Through Precise Application of Derating Factors

Beyond inspection, long-term reliability is achieved by operating components well below their maximum specified limits. These derating factors are critical for preventing premature failure in high-stress environments.

Table 1. Microcircuit Derating Factors (MIL-STD-11991B, Table AVI)

Critical Stress Parameter	Digital	Linear
Maximum Supply Voltage	0.90	0.80
Power Dissipation	0.80	0.75
Max Junction Temperature	40°C below max	40°C below max

Table 2. Capacitor Derating Factors (MIL-STD-11991B, Table AI)

Type	Voltage Derating Factor	Max Case Temperature
Ceramic / Glass / Plastic Film	0.50	20°C below max
Tantalum, Solid	0.50	70°C / 110°C
Aluminum Electrolytic	Not allowed	Not allowed

Why It Matters

Applying these mathematical rules is non-negotiable for mission-critical hardware. It represents a rule-based system of quality control that mirrors the structured credit and assessment rules within educational frameworks.

📖 NotebookLM

Verifying System Integrity Relies on Standardized Environmental and Mechanical Test Methods

Component and system robustness is validated through repeatable, documented test procedures outlined in standards like MIL-STD-202G. These methods simulate real-world stresses from handling, vibration, and shock.

Terminal Strength (Method 211A)

Purpose: Ensures terminals withstand mechanical stress.

Tests: Pull (Tensile), Bend, Twist (Torsion), Torque.

Key Parameter: Specifies forces (e.g., 0.5 to 20 lbs) and cycles.

Particle Impact Noise Detection (PIND) (Method 217A)

Purpose: Detects free-moving contaminants in sealed devices.

Process: Uses a shaker, ultrasonic transducer, and oscilloscope.

Outcome: A single burst of particle noise results in rejection.

Random Vibration (Method 214A)

Purpose: Determines ability to withstand operational vibration.

Test Conditions: Standardized curves (e.g., Power Spectral Density of 0.02 to 1.50 g²/Hz).

Why It Matters

These methods provide objective, evidence-based proof of quality. The requirement for traceable mounting fixtures and documented procedures is analogous to the need for standardized assessment tools and moderation reports in education.

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Educational Compliance is Governed by the National Qualifications Framework (NQF)

The South African Qualifications Authority (SAQA) and Department of Higher Education & Training (DHET) define the rules for qualifications, assessment, and moderation, ensuring national standards of competence.

Table 1: ICASS Assessment Structure (Report 191)

Component	Weighting	Minimum to Qualify	Validity
Test 1	30%	40%	1 Year
Test 2	70%	40%	1 Year

Table 2: Module Weighting: Electrical Trade Theory N1

Module	Weight Value (%)
Direct Current Theory	30%
Wiring of Premises	25%
Safety Precautions	10%
Magnetism & Electromagnetism	10%
Other Modules	25%

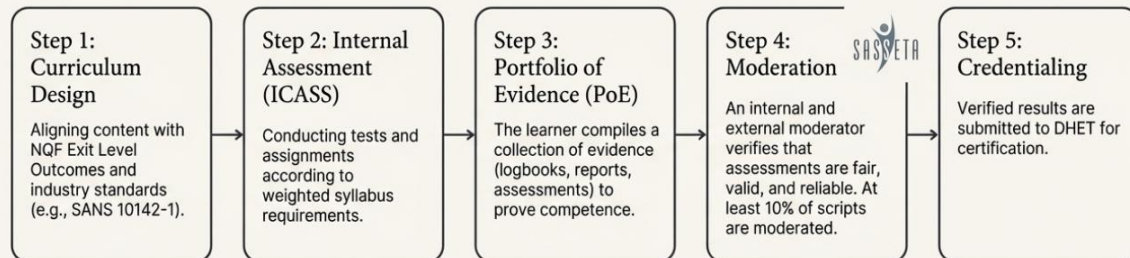


Department
Higher Education
and Training
Republic of South Africa



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The Integrity of Qualifications is Maintained Through Rigorous Assessment and Moderation

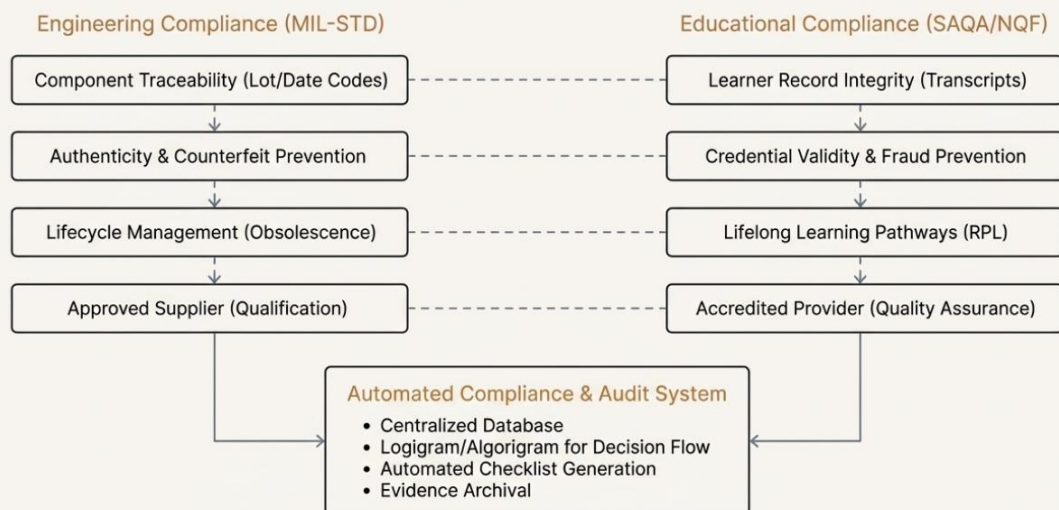


Why It Matters

The Portfolio of Evidence serves the same function as an engineering design history file. It is a curated, auditable record that provides traceable proof of competence against a defined standard.

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Engineering Reliability and Educational Validity Share a Common Systemic DNA

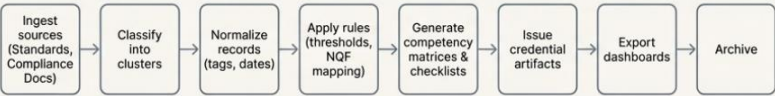


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Automation is Achieved by Translating Compliance Rules into Code and Logic

The principles of compliance can be encoded into repeatable, scalable tools using VBA and logical diagrams, creating systems that manage evidence, automate assessment, and generate audit-ready documentation.

The Logic (Algorigram)



The Data Model (VBA Snippet)

```
VBA Data Model for Source Management

Public Enum ClusterType
    ctStandards = 1
    ctCompliance = 2
    ctCorporate = 3
    ctProjects = 4
End Enum

Public Type SourceItem
    Id As Long
    Title As String
    Tags As String
    DateStamp As Date
    Cluster As ClusterType
End Type
```

Why It Matters

This is not just about programming; it's about systems architecture. By structuring disparate data types (from MIL-STDs to SAQA policies) into a unified model, we can build a single tool to manage and audit them.

Automated Systems Can Generate Dynamic Tools for Competency Assessment

This VBA-powered diagnostic quiz demonstrates how curriculum requirements can be transformed into an interactive assessment tool, complete with question logic, answer validation, and explanatory feedback.

Diagnostic Quiz: Integrated Compliance

Question 1
Which South African regulatory body oversees the National Qualifications Framework (NQF)?

☐ A) DHET

☒ B) SAQA

☐ C) QCTO

☐ D) MERSETA

Correct: B) SAQA. SAQA manages the NQF, ensuring standardization of qualifications.

Question 2
What material in military connectors poses a corrosion risk in severe environments?

☒ A) Nickel-plated aluminum

☐ B) Passivated stainless steel

☐ C) Tin-plated brass

☐ D) Stainless steel

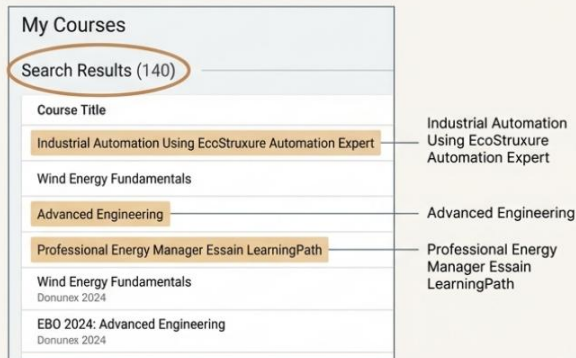
Correct: A) Nickel-plated aluminum. Nickel-plated aluminum suffers corrosion/mechanical risks in severe environments.

```
Logic:
'If Answer = Correct Then
  Score++ -> Log 'Correct' Else
  Log 'Incorrect' with explanation`
```

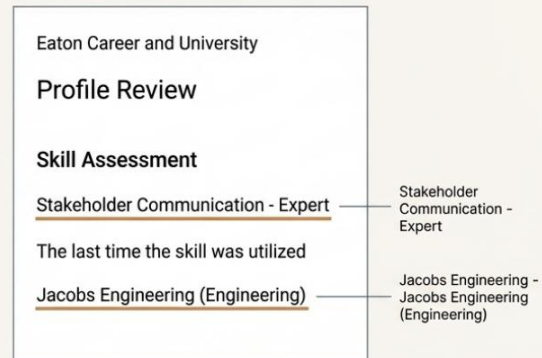
Expertise is Validated Through Continuous Learning and Engagement with Industry Leaders

Applying engineering and systems thinking in corporate environments requires continuous upskilling and a commitment to industry best practices, as demonstrated by engagement with global leaders in energy management and electrical engineering.

Schneider Electric



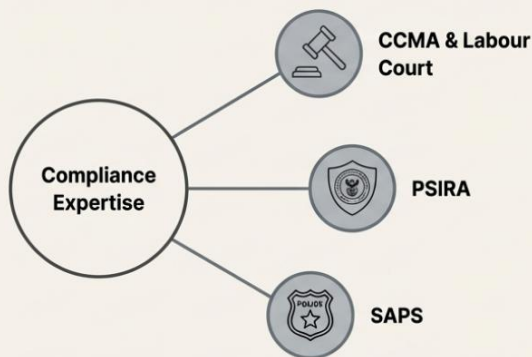
Eaton



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Mastery of Compliance is Proven in High-Stakes Regulatory and Legal Arenas

The ultimate test of compliance expertise lies in navigating formal regulatory and legal systems. This involves meticulous documentation, evidence management, and argumentation across multiple state and private sector bodies.



- **CCMA & Labour Court:** Managing proceedings involving unfair dismissal claims, arbitration outcomes, and transcript certification, requiring formal evidence submission (Case Ref GAJB6808-15).
- **PSIRA (Private Security Industry Regulatory Authority):** Filing and managing formal complaint records against employers regarding statutory obligations and provident fund contributions.
- **SAPS (South African Police Service):** Interfacing with law enforcement, including providing witness statements and documentation for investigations.

Why It Matters

This experience demonstrates not just theoretical knowledge of rules, but the practical resilience and meticulous attention to detail required to enforce compliance and defend rights within formal legal frameworks.

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Technical Proficiency is Kept Current with Certifications in AI and Modern Development Tools

Staying relevant requires mastery of the tools that are shaping the future of engineering and automation. These Microsoft credentials demonstrate proficiency in AI, developer productivity, and cloud solutions.



GitHub Copilot Tools Achievements



Implement code improvements



Develop unit tests



Develop code features



Generate documentation



Completed Microsoft Training Courses

- Plan and prepare to develop AI solutions on Azure
- Develop an AI App with the Azure AI Foundry SDK
- Explore AI for All
- Boost your productivity with Microsoft Copilot

943 Modules Completed

216 Learning Paths Completed

756+ Training Hours

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A Comprehensive Portfolio of Evidence is Available for Review

Every claim made in this presentation is backed by a deep and organized portfolio of primary-source documents, providing an auditable trail of qualifications, experience, and accomplishments.

Academic Credentials

- DHET / SAQA National N Diploma Transcripts
- St. Peace College Certificates



Professional Moderation

- SASSETA Assessor & Moderator Records
- ICASS / ISAT Moderation Reports



Corporate Training

- Schneider Electric Learning Transcript (140+ entries)
- Eaton University Profile & Skill Assessments



Technical Certifications

- Microsoft AI & GitHub Copilot Badges/Transcripts



Legal & Regulatory Filings

- CCMA Arbitration Records
- PSIRA Complaint Forms



Engineering Standards Analysis

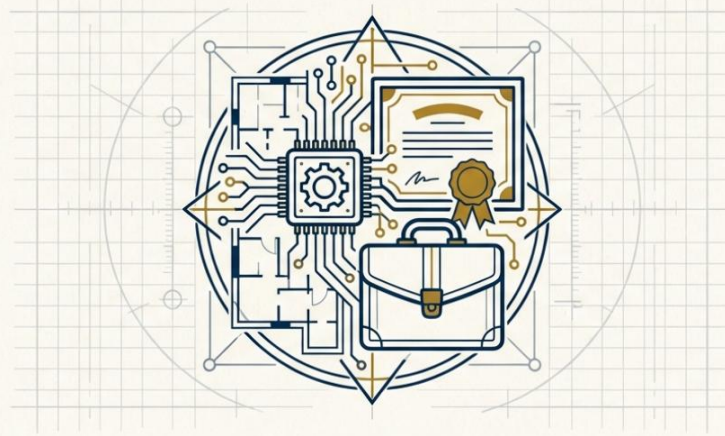
- Comparative Reports (MIL-STD vs. IEC)
- Technical Checklists & Derating Tables



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The Integrated Competency Framework

A Synthesis of Advanced Engineering Standards, Educational Assessment, and Professional Practice



Tshingombe Tshitadi

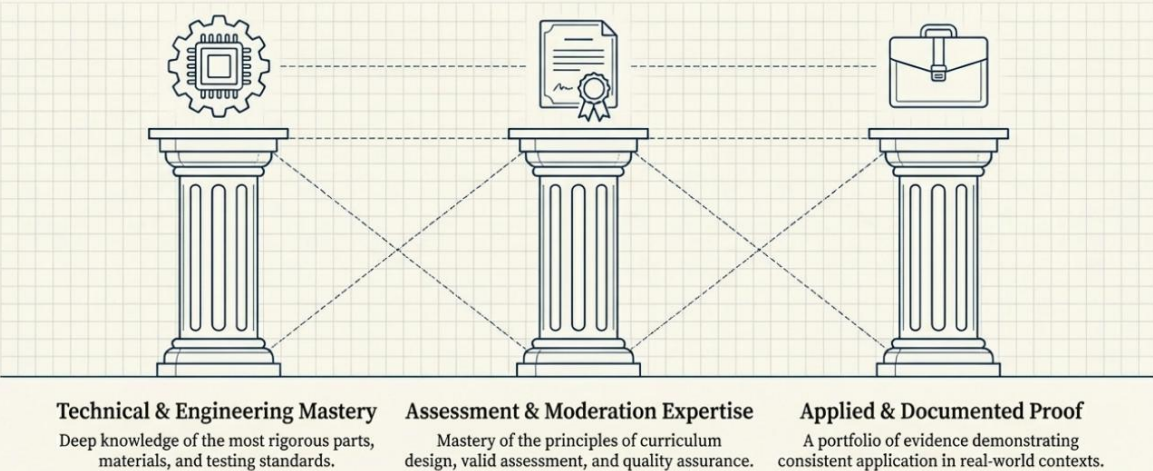
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The Competency Gap: Bridging Technical Standards and Verifiable Skill



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The Solution: An Auditable Framework for Holistic Mastery



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Pillar 1: Mastery of Component Lifecycle and Supply Chain Integrity (MIL-STD-11991B)

Key Concepts

- **Scope:** Management of Parts, Materials, and Processes (PM&P).
- **Core Functions:** COTS Evaluation, Counterfeit Prevention, and Lifecycle Management.
- **Key Principle:** Ensuring reliability, authenticity, and lifecycle management of all components.

Data in Action

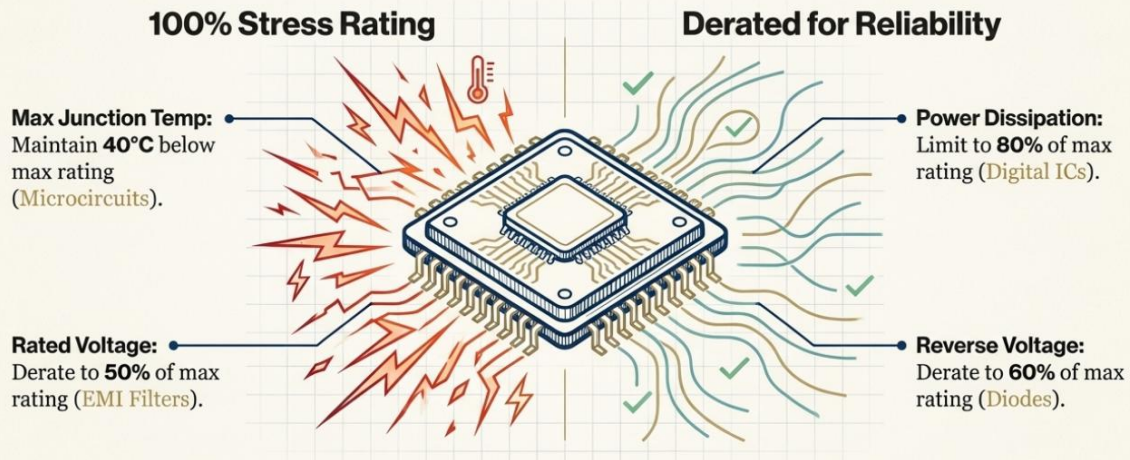
Table 1: PM&P Incoming Inspection Data Requirements

Requirement	EEE parts	Mechanical parts	Materials
Requirement: Database fields maintained for life of program	Yes	Yes	Yes
Requires non-destructive testing like Radiological Inspection (X-ray) for internal defects and PIND for detecting loose particles.			
Mandates a Certificate of Conformance (C of C) for all parts and materials.			

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Pillar 1: Engineering for Durability: The Science of Derating



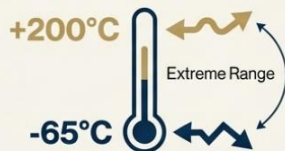
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Pillar 1: Validating Performance Under Extreme Conditions (MIL-STD-202G)

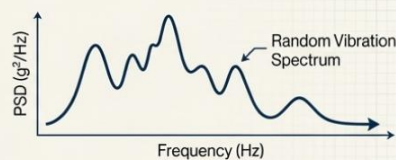
Method 107G: Thermal Shock

Simulates extreme temperature changes from high to low.



Method 214A: Random Vibration

Ensures survival in operational environments (e.g., aircraft, vehicles).



Method 217A: Particle Impact Noise Detection (PIND)

Detects loose particles inside sealed components that could cause latent failures.



A single burst of particle noise = rejection

Method 211A: Terminal Strength

Ensures terminals withstand mechanical stress during installation.



Pull



Bend

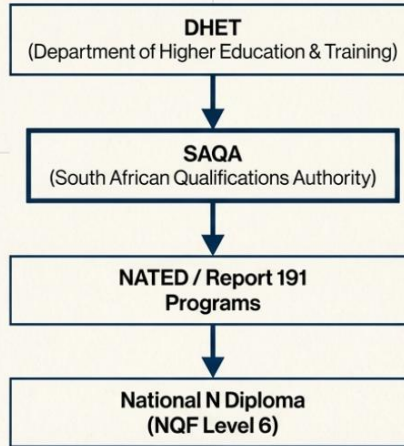


Twist

NotebookLM



Pillar 2: Expertise in National Qualification Frameworks & Assessment Policy



Oversees the NQF (National Qualifications Framework)

The Role of an Assessor/Moderator

Ensuring all assessments are Fair, Valid, Reliable, and Practical.

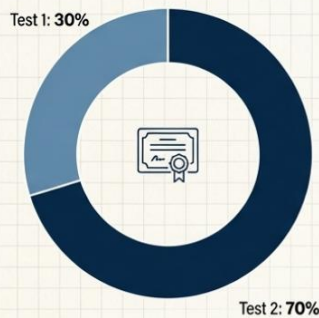
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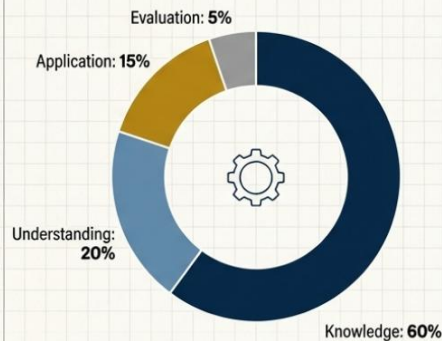
Pillar 2: Engineering the Assessment: Weighting, Cognition, and Structure

Syllabus: Electrical Trade Theory N1 (2021)

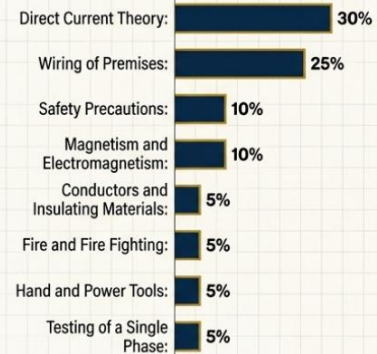
Internal Continuous Assessment (ICASS)



Final Exam: Cognitive Levels



Syllabus Module Weighting



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Pillar 3: Verifiable Proof: National N Diploma in Electrical Engineering

Mathematics N1-N6

Engineering Science N1-N4

Electrical Trade Theory N1-N3

ST. PEACE COLLEGE

SAQA N DIPLOMAT

This is to certify that

TSHINGOMBE TSHITADI

has been awarded a

NATIONAL DIPLOMA
ENGINEERING
ELECTRICAL



ST. PEACE COLLEGE

Industrial Electronics N1-N6

Electrotechnics N4-N6

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Pillar 3: Continuous Development with Industry Leaders

Schneider
Electric

**14.15 Hours
Aggregate Training**

Industrial Automation using
EcoStruxure

Professional Energy Manager
Esain LearningPath



EAT•N

**Career and University
Certificate and Product
of Profile Review**

**Stakeholder
Communication
(Expert)**



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Pillar 3: Application in High-Stakes Environments



Application Role: Senior Technician (Civil & Electrical)

Relevance: Critical role in national infrastructure, requiring deep knowledge of compliance and technical standards.



Application Role: Manager, Security Systems Design and Applications

Relevance: Role demands highest levels of reliability, risk management, and system integrity for national security.

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Pillar 3: Upholding Standards in Professional and Legal Arenas

CCMA & Labour Court

- **Focus:** Unfair Dismissal Claims, Arbitration, Transcript Certification.
- **Evidence:** References case numbers such as GAJB6808-15.



PSIRA Complaint Records

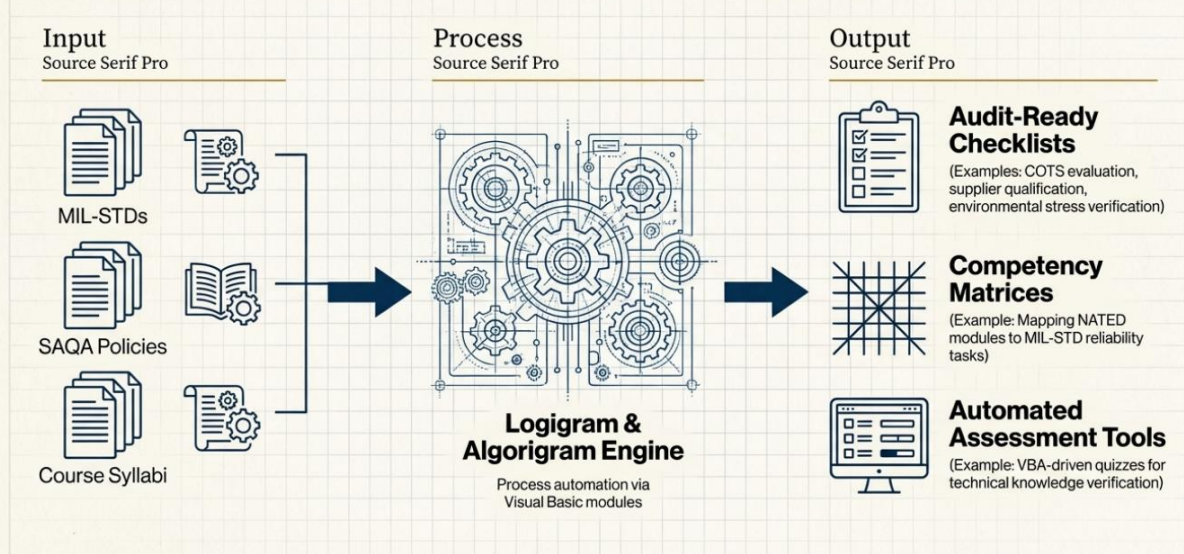
- **Focus:** Upholding Statutory Obligations (e.g., Private Security Sector Provident Fund).
- **Evidence:** Cites failure to 'remit all levy contributions' as per the Levies Collective Agreement.



Leveraging a deep understanding of compliance and documentation to ensure procedural fairness and uphold regulatory standards.

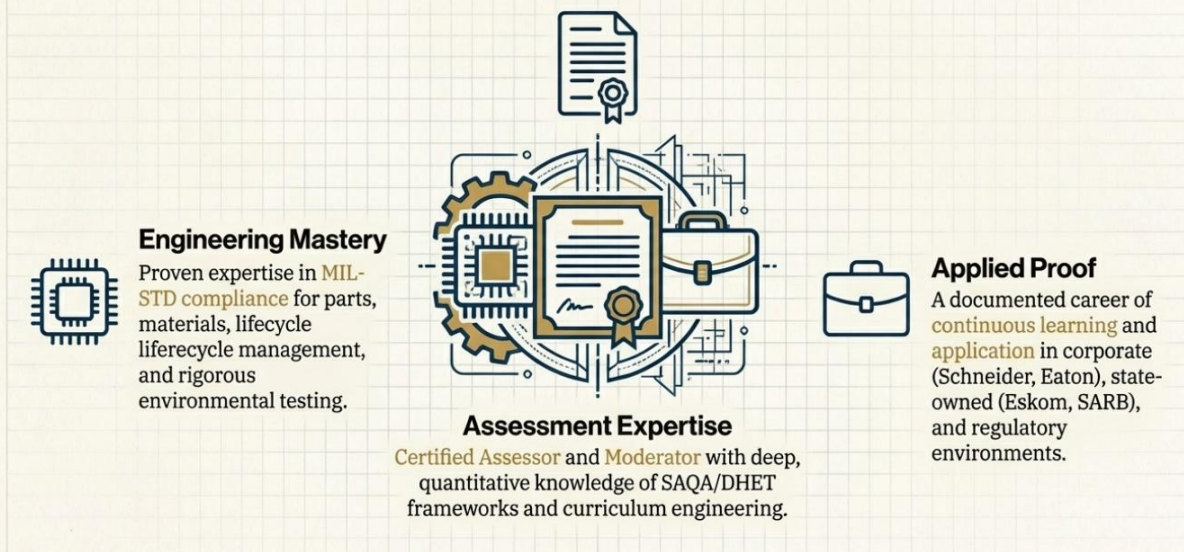
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From Framework to Function: The Operational Toolkit



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A Unique Profile: Engineer, Educator, and Systems Thinker



📄 NotebookLM

Contact & Further Information

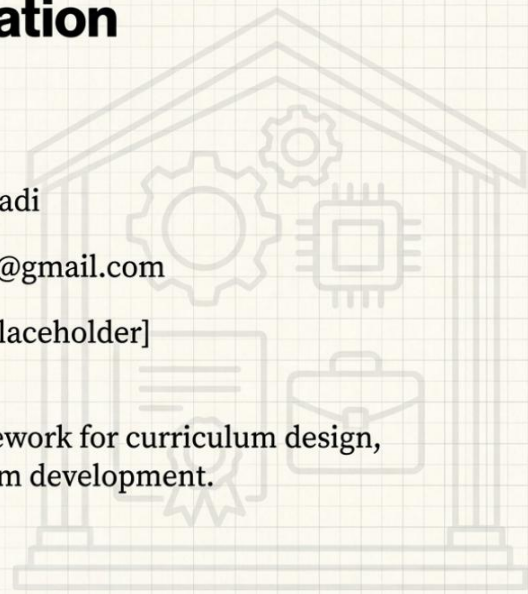


Name: Tshingombe Tshitadi

Email: tshingombefiston@gmail.com

LinkedIn Profile: [URL Placeholder]

Available to discuss applications of this framework for curriculum design, design, compliance auditing, or technical team development.



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Building an Audit-Ready Career: A Blueprint for Technical Excellence

Dual Role: Practitioner and Assessor/Moderator
Applies engineering knowledge while also ensuring fair and valid assessment practices.



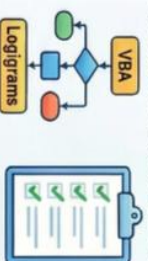
Focus on Lifecycle Management & Counterfeit Prevention



Implements processes from military standards to ensure reliability and authenticity of components.



Development of Automated Audit Tools
Creates tools (VBA, Logigrams) to translate complex standards into practical audit routines.



Mastery of Technical & Safety Standards
Expertise spans military, international, and national compliance frameworks.

National N Diploma in Engineering (NQF Level 6)
A structured qualification requiring N1-N6 certificates plus 24 months of practical experience.



Rigorous Assessment Structure (ICASS)
Trimester marks are weighted: 30% for Test 1 and 70% for Test 2.

The Competency Profile of a Modern Engineer: From Core Principles to Advanced Technology

FOUNDATIONAL ENGINEERING & EDUCATION



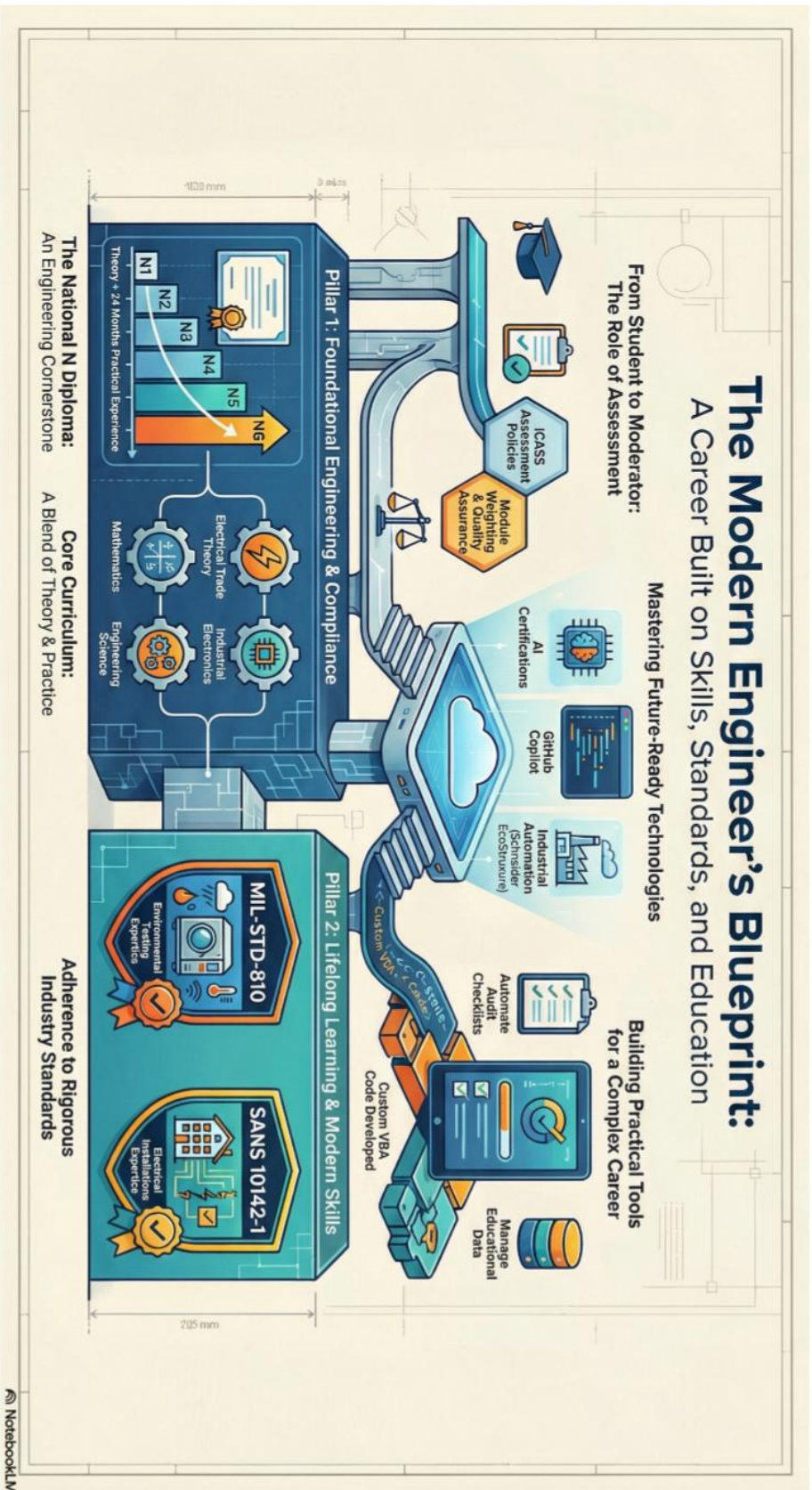
**National N Diploma
in Engineering
(NQF Level 6)**
Completed N1-N6 certificates in
Electrical Engineering under the
SAQA/DHET framework.

**Expertise in Military &
International Standards**
Deep knowledge of MIL-STD-810
(Environmental Testing) and
IEC 62368-1 (Safety).

**Proficient in AI
& Automation
Technologies**
Skilled in Agentforce (Salesforce)
and GitHub Copilot tools for
code development.

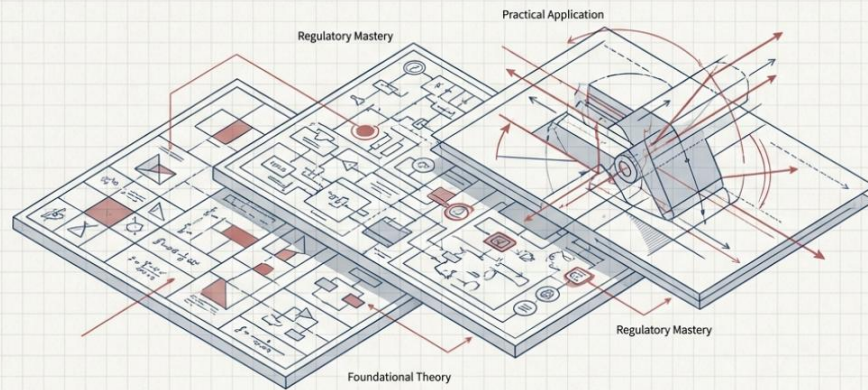
**Skills in Modern
Software Development**
Completed modules in
C# programming and GitHub
administration via
Microsoft Learn.





The Anatomy of a Modern Engineer

A Case Study in the Synthesis of Foundational Theory, Regulatory Mastery, and Practical Application.



This presentation deconstructs the capabilities of a world-class engineering professional, demonstrating that true expertise lies at the intersection of academic knowledge, mastery of complex standards, and proven application.

NotebookLM

The Case Study: Tshingombe Tshitadi



To understand the modern engineering professional, we will analyze the career and qualifications of Tshingombe Tshitadi. His journey provides a blueprint for integrating South Africa's rigorous educational frameworks with the demanding standards of global engineering compliance and the practical challenges of the workplace.

National N Diploma in Engineering (NQF Level 6)



Demonstrated Expertise in US Military & International Standards (MIL-STD, IEC)



Registered SASSETA Assessor and Moderator



Pillar I: Building on a Foundation of Verifiable Academic Theory

Excellence begins with a robust, nationally recognized education. The South African Qualifications Authority (SAQA) and the Department of Higher Education and Training (DHET) provide the framework for this foundation.



Evidence Box 1: Qualification Details

Qualification Title
National N Diploma Engineering



SAQA Qualification ID
90674

NQF Level
6 (360 Credits)

Quality Assurance
QCTO (Quality Council for Trades and Occupations)



Evidence Box 2: Transcript Synthesis

Learner Name
Tshingombe Tshitadi

SAQA Asset ID
09121

Institutional Code
30_39

Most Recent DHET Submission
Status: Submitted (2024-02-12)

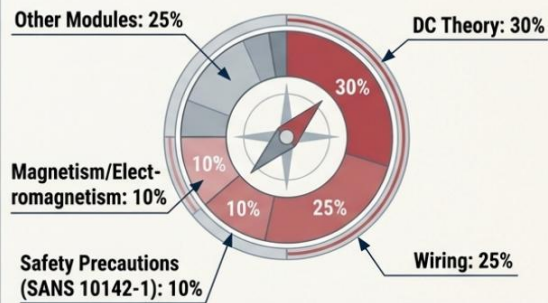
Deconstructing the Engineering Curriculum: From N4 to N6

The National N Diploma is achieved through a progressive series of certificates (N4, N5, N6), ensuring a comprehensive understanding of both core principles and advanced applications.

N4-N6 Subject Progression

Level	Key Subjects
N4	Mathematics, Engineering Science, Industrial Electronics
N5	Electro-technics, Digital Electronics, Power Machines
N6	Supervisory Management, Control Systems, Installation Rules, Specialised Electric Codes

Core Module Weighting (Electrical Trade Theory N1)

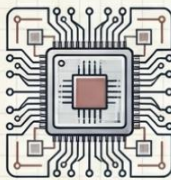


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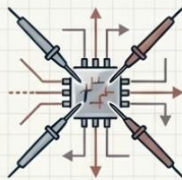
Pillar II: Achieving Mastery Over High-Stakes Regulatory Standards

Theoretical knowledge must be tested against the world's most rigorous compliance frameworks. US Military Standards (MIL-STDs) represent the gold standard for ensuring reliability, safety, and performance in critical systems. Mastery of these standards is non-negotiable for high-stakes engineering.

THE GAUNTLET



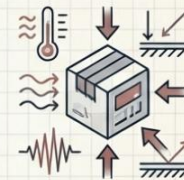
MIL-STD-11991B: Parts, Materials, and Processes (PM&P) Management



MIL-STD-202G: Test Methods for Electronic and Electrical Component Parts



MIL-STD-461: Electromagnetic Interference (EMI) Control



MIL-STD-810: Environmental Engineering Considerations

© NotebookLM

Evidence of Mastery: Managing Parts, Materials, and Processes (MIL-STD-11991B)

Effective engineering requires stringent control over every component. MIL-STD-11991B mandates a comprehensive system for PM&P management, including detailed incoming inspection procedures to prevent counterfeit parts and ensure quality.

Excerpt from Appendix F, Table FI (Electronic Components Inspection)

Test/Inspection	Indicators	Purpose
Documentation Check	Spelling/grammar errors, omissions	Detect fake documentation
Marking Permanency	Removal of ink marking	Detect remarked parts
Surface Finish (Acetone)	Removal of coating, sanding marks	Detect blacktopped parts
X-ray (Radiological)	Inconsistent die size/leadframe	Detect incorrect die/wrong parts

Insight

This level of scrutiny goes far beyond a simple visual check. It requires a systematic, evidence-based process to ensure supply chain integrity and prevent catastrophic system failures from a single counterfeit component.

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Ensuring Reliability Under Stress: The Science of Component Derating

Mastery extends to predicting and preventing failure. Derating—operating components below their maximum specified ratings—is a critical engineering discipline that dramatically increases system reliability and lifespan. MIL-STD-11991B provides precise derating factors.

Distilled Derating Factors (from MIL-STD-11991B, Appendix A)

Table 1: Microcircuit Derating Factors

Parameter	Digital	Linear
Max Supply Voltage	0.90	0.80
Power Dissipation	0.80	0.75
Max Junction Temp.	40°C below max	40°C below max

Table 2: Capacitor Derating Factors

Type	Voltage Factor	Note
Aluminum Electrolytic	Not allowed	Requires specific approval
Ceramic / Glass / Film	0.50	Standard for high-rel
Tantalum, Solid	0.50 (non-surge)	Surge-tested required

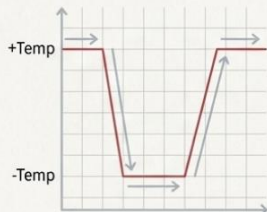
Insight

Applying these factors is not a suggestion; it's a core requirement. It demonstrates an understanding of how electrical and thermal stresses impact component life, directly linking design choices to mission success.

📖 NotebookLM

Proving Resilience: Environmental and Mechanical Stress Testing (MIL-STD-202G)

Components must survive the environments in which they operate. MIL-STD-202G defines standardized test methods to ensure electronics can withstand severe thermal shock, vibration, and mechanical stress, simulating entire operational lifecycles.



Thermal Shock (Method 107G, Table 107I)

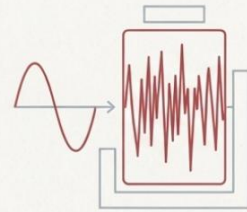
- **Profile A:** -55°C ↔ +85°C
- **Profile B:** -65°C ↔ +125°C
- **Profile F:** -65°C ↔ +150°C

*(Cycles: 5, 25, 50, or 100)

Random Vibration (Method 214A, Table 214I)

- **Test Condition B:** 7.56 Grms
- **Test Condition D:** 11.95 Grms
- **Test Condition G:** 23.91 Grms

*(Durations: 3 min up to 8 hours)



Insight

This is not just about ruggedization. It's about data-driven assurance. Specifying and interpreting these tests requires a deep understanding of physics, materials science, and failure analysis.

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Connecting the Dots: How Foundational Theory Enables Regulatory Mastery

The rigorous standards of MIL-STDs are not learned in a vacuum. They are applied extensions of the fundamental principles taught in the engineering curriculum. This is where theory becomes practice.

DHET Curriculum

Module: Electrical Trade Theory: DC Principles (30% weight)
Concept: Ohm's Law, Power Dissipation, Component Behavior

Informs the practical application of...

MIL-STD Requirement

Standard: MIL-STD-11991B, Table AIII
Application: Calculating Diode Derating Factors (Forward Current: 0.50, Power: 0.50) to prevent thermal runaway.

DHET Curriculum

Subject: Engineering Science N4
Concept: Material Properties, Coefficients of Thermal Expansion

Is essential for interpreting...

MIL-STD Requirement

Standard: MIL-STD-202G, Method 107G
Application: Understanding failure modes during Thermal Shock testing due to CTE mismatch.

NotebookLM

Pillar III: The Proving Ground of Practical Application

Expertise is ultimately validated in the field. The visit by NATED engineering students to City Power, Johannesburg's municipal utility, provided a complex operational environment to apply and assess curriculum knowledge against real-world infrastructure and challenges.



Job Shadowing: Observing and participating in day-to-day tasks within the Metering, Test Branch, and Customer Service units.



Site Inspection: Assessing technical standards (e.g., SANS 10142) at substations and metering points.



Curriculum Validation: Engaging with City Power staff to align NATED syllabi with current industry practices, including smart metering and renewable energy integration.



Portfolio Development: Collecting evidence of workplace activities for the National Trade Portfolio.

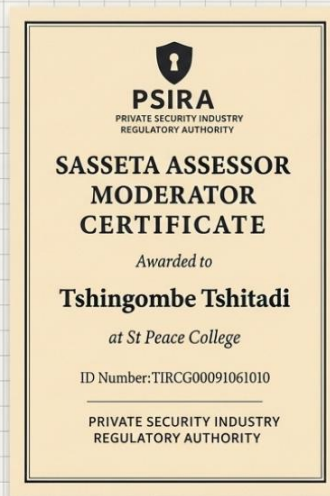
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The Synthesis of Expertise: The Role of the Assessment Moderator

The ultimate demonstration of mastery is the ability to fairly and accurately assess the competence of others. As a registered SASSETA Assessor and Moderator, one must possess a comprehensive command of both the educational framework (DHET/SAQA) and the practical standards of the industry.

Key Responsibilities of a Moderator

- Review assessment tasks for technical accuracy, content coverage, and fairness.
- Verify that assessments align with national curriculum standards (SAQA unit standards).
- Ensure consistency and reliability in marking across multiple assessors.
- Provide feedback to uphold the quality and credibility of the qualification.



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A Portfolio of Verifiable Credentials

Each credential represents a milestone in the journey of integrating theory, mastery, and application, validated by national and professional bodies.



Recognition within South Africa's highest academic oversight body.



Engagement with the Engineering Council of South Africa, the statutory body for the profession.



Certified competence in assessment and quality assurance for the safety and security sector.

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Extending Impact: From Personal Mastery to Systemic Contribution

True expertise is not siloed; it is shared to elevate the entire professional ecosystem. Contributions to educational and development initiatives bridge the gap between industry and academia for the next generation.



Key Contribution: Sci-Bono Journey Expert Assessment Library

- **Objective:** Support Science, Technology, Engineering, Arts, and Mathematics (STEAM) education in South Africa and the SADC region.

● Outputs:



Developed resources and workshops for **Digital CV Writing** to enhance learner employability.



Provided guidance and materials for **Learner Job Preparation**, interview skills, and workplace integration.

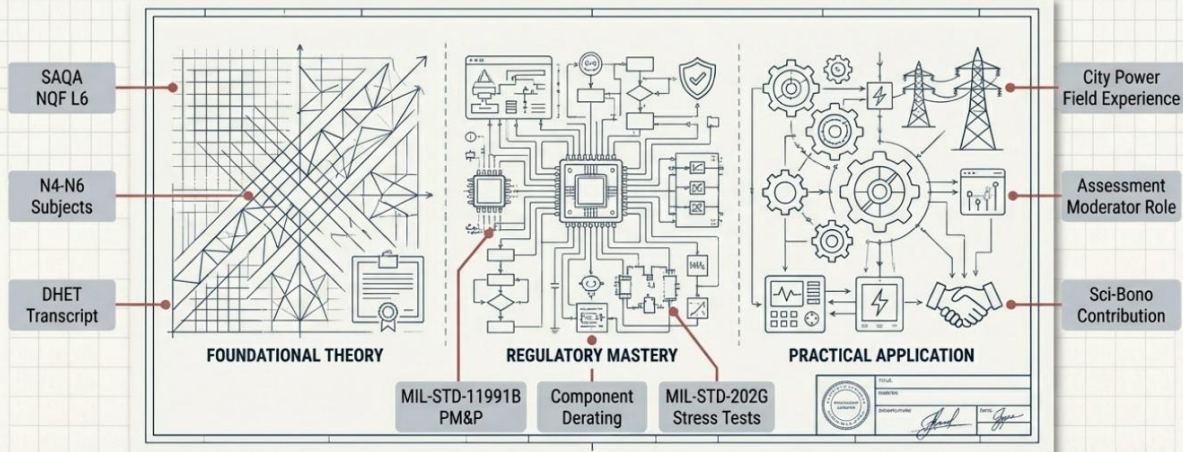


Authored **Technical Documentation** and assessment briefs for electrical engineering.

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The Blueprint for Engineering Excellence

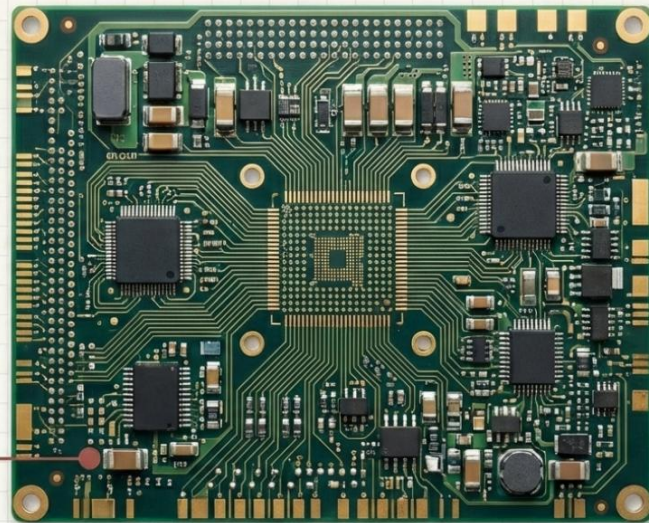
The case of Tshingombe Tshitadi provides a clear and replicable blueprint for the modern engineer. It is a model built on a verifiable foundation of theory, hardened by the mastery of exacting global standards, and proven through practical application and contribution.



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Integrated Expertise is the Bedrock of Reliable Systems

In a world of increasing complexity, the safety, reliability, and innovation of our critical systems depend not on specialists in isolated domains, but on integrated professionals who can navigate the entire lifecycle from theory to application. The standard for engineering is not just knowledge, but **synthesis**.



NotebookLM



The Learner's Journey Begins

Meet Tshingombe Tshitadi. His journey from student to expert provides a unique lens through which to understand the ecosystem of modern engineering.

The National N Diploma, a South African NQF Level 6 qualification, is the culmination of this foundational stage.



The Rules of the Game: South Africa's National Qualifications Framework (NQF)

The NQF provides a structured, credible system for all education and training in South Africa. The National N Diploma is a significant milestone within this framework.

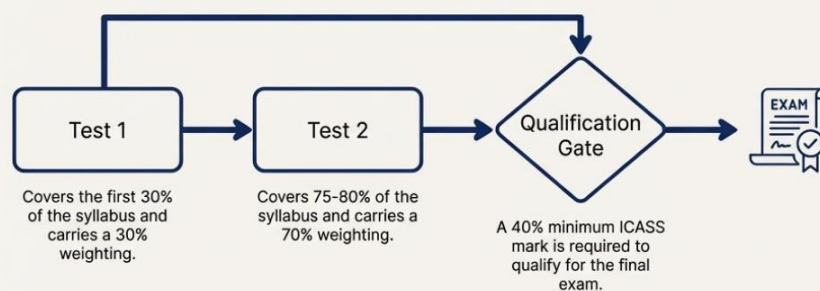
Progression to the National N Diploma (SAQA ID 90674)



NotebookLM

Measuring Mastery: The Internal Continuous Assessment (ICASS) Framework

For NATED Engineering Studies (Report 191), progress is measured through a structured Internal Continuous Assessment (ICASS) process. A minimum term mark is required to even qualify for the final national examination.



The Role of the Assessment Moderator



All assessment instruments and a sample of marked scripts are reviewed by a subject matter expert to ensure fairness, validity, and consistency, a role our protagonist will later assume.

NotebookLM

The Rosetta Stone of Reliability: MIL-STD-11991B

This standard establishes the general requirements for managing Parts, Materials, and Processes (PM&P) across the entire lifecycle of military systems, from development to sustainment.



Supplier Control

Mandates the use of approved or authorized suppliers to ensure authenticity and reliability. Defines a broker as a high-risk, unauthorized source.



Lifecycle Management

Establishes a proactive approach to component obsolescence, derating for reliability, and data retention for the life of the program.



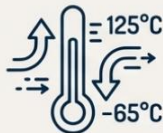
Threat Mitigation

Requires documented processes for counterfeit prevention, corrosion control (CPC), and electrostatic discharge (ESD) protection.

📖 NotebookLM

Engineering for Reality: Surviving Environmental and Mechanical Stresses

Components for critical systems are not just designed to function; they are rigorously tested to survive the harsh realities of their operational environment, as defined by standards like MIL-STD-202G and MIL-STD-810.



Thermal Shock (Method 107G)

Subjects components to extreme temperature shifts (e.g., -65°C to +125°C) in under 10 seconds to test material integrity.



Random Vibration (Method 214A)

Simulates the intense, multi-frequency vibrations experienced during launch or on aircraft, measuring endurance up to 46 G RMS.



Particle Impact Noise Detection (PIND) (Method 217A)

Uses a shaker and ultrasonic transducer to detect loose particulate contaminants inside sealed cavity devices that could cause latent failures.



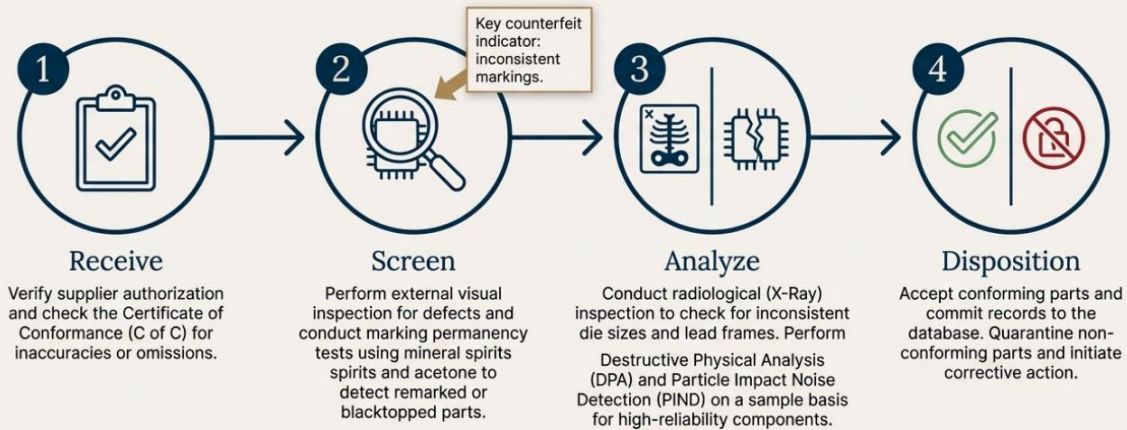
Random Drop (Method 203C)

Simulates repeated impacts from handling and service by tumbling the component in a steel cage for 45 minutes.

📖 NotebookLM

The First Line of Defense: Auditing Incoming Components

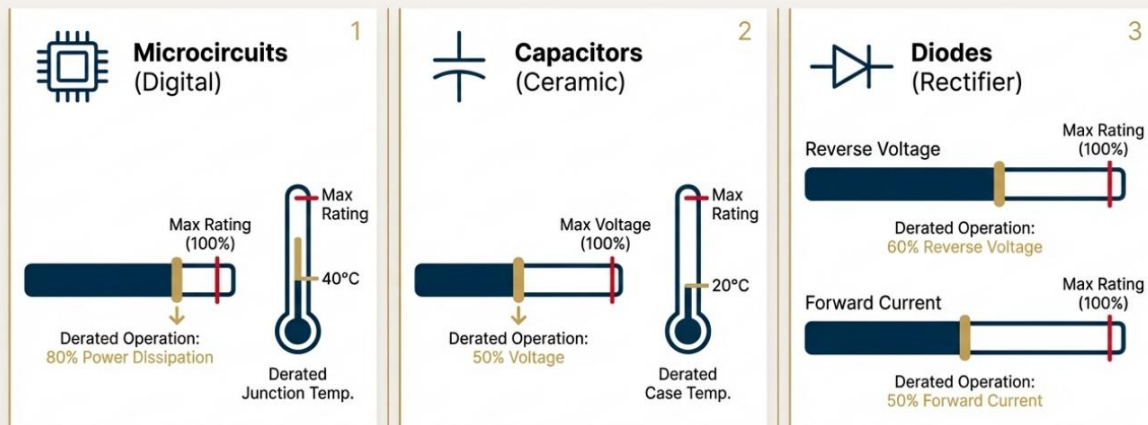
Based on MIL-STD-11991B, a multi-stage inspection process is critical to preventing counterfeit and defective parts from entering the supply chain.



NotebookLM

Designing for Margin: The Engineering Discipline of Derating

Derating is the practice of operating components at less than their maximum rated stress levels to increase reliability and extend service life. MIL-STD-11991B provides specific factors for critical components.



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The Real-World Testbed: A Curriculum Assessment at City Power

To ensure the NATED engineering curriculum aligns with industry needs, an assessment visit was conducted at City Power, Johannesburg's municipal utility. This provided a crucial link between theory and practice.

1

Curriculum Validation: NATED syllabi were validated against live operational challenges in metering, fault diagnosis, and network maintenance.

2

Portfolio of Evidence: The visit provided critical, verifiable evidence for the National Trade Portfolio, a mandatory requirement for the N-Diploma.

3

Informed Curriculum Design: Exposed students and lecturers to systemic challenges like load shedding and service delivery delays, highlighting the need for resilient and adaptive engineering solutions in the curriculum.

NotebookLM

Synthesizing Global Standards: MIL-STD vs. IEC

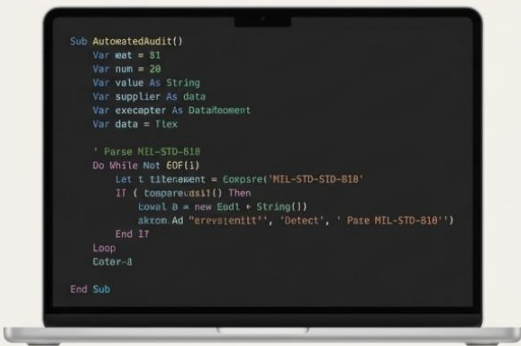
An expert must operate across different regulatory landscapes. A comparison of MIL-STD-100G (US Defense) and IEC 62368-1 (International Safety) reveals key differences in philosophy and application.

	MIL-STD-100G	IEC 62368-1
Scope	Focuses on Engineering Drawing Practices , ensuring uniformity and interoperability for defense materiel.	A Hazard-Based Safety Engineering (HBSE) standard for audio/video and IT equipment, focused on preventing injury from energy sources.
Documentation Philosophy	Prescriptive about drawing formats, numbering, and revision control to support a multi-decade logistics chain.	Requires documentation that demonstrates risk analysis and mitigation (e.g., identifying energy sources, safeguards, and user classifications).
Qualification	Emphasizes qualification via Source Control Drawings and strict configuration management.	Focuses on testing and certification to prove compliance with safety requirements.

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Automating Compliance: Building Audit-Ready Tools

To enhance efficiency and ensure repeatability in auditing, custom tools were developed using Visual Basic for Applications (VBA). This elevates compliance from a manual checklist to an automated, data-driven process.



Custom VBA Modules were developed to:



- **Automate Data Entry and Tracking:** Create standardized logs for suppliers, incoming inspection results, and defect tracking, minimizing human error.



- **Generate Dynamic Audit Checklists:** Parse standards like MIL-STD-810 directly from text into structured Excel checklists for environmental testing.



- **Visualize Decision Logic:** Implement logigrams (workflow maps) and algorigrams (decision-tree diagrams) to model complex processes like COTS acceptance or counterfeit detection.

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Beyond Components: Ensuring Operator Safety with NIJ Standards

A truly reliable system protects its users. The National Institute of Justice (NIJ) standard for ballistic resistance provides a clear classification system for body armor, ensuring predictable performance against specific threats.

			
Type IIA	Type IIIA	Type III	Type IV
Protects against 9mm and .40 S&W handgun rounds.	Highest level of handgun protection, stopping .357 SIG and .44 Magnum rounds.	Protects against 7.62mm rifle rounds (e.g., M80).	The highest rating, designed to defeat .30 caliber armor-piercing (AP) rifle rounds.

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The Synthesis of a Professional: An Integrated Portfolio of Expertise

The journey from student to practitioner culminates in the ability to integrate knowledge across multiple domains, applying theoretical frameworks to solve real-world problems



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Building the Next Generation of Experts

The journey of one expert provides a blueprint for improving how we train and equip future technologists and engineers.

- **1. Integrate Standards into Curricula**
Vocational curricula (N1-Vocational curricula (N1-N6) should embed core concepts from MIL-STD and IEC standards early, connecting theory to high-reliability practice from day one.
- **2. Mandate Practical Industry Audits**
Industry visits, like the one to City Power, must become a core, assessed component of every N-Diploma to ensure graduates are truly job-ready.
- **3. Foster Digital Literacy for Compliance**
Equip students with foundational coding skills (VBA, Python) to empower them to build their own tools for automating audits and managing compliance data.

NotebookLM

Tshingombe Tshitadi

Expert Assessor & Engineer

✉ email@domain.com

🌐 linkedin.com/in/username

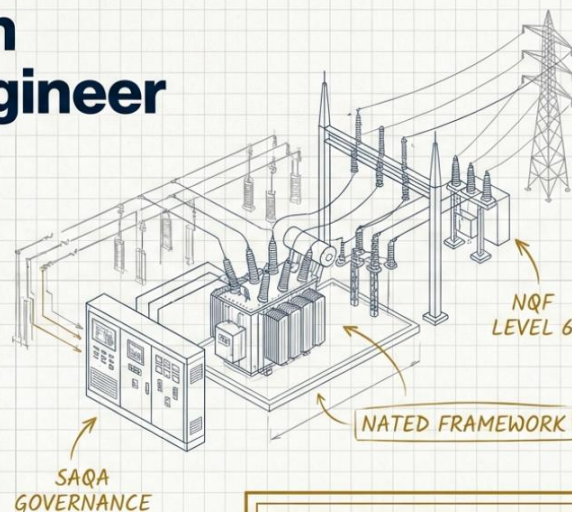
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The Blueprint for an Industry-Ready Engineer

Tracing the South African NATED Pathway from Foundational Theory to National Diploma

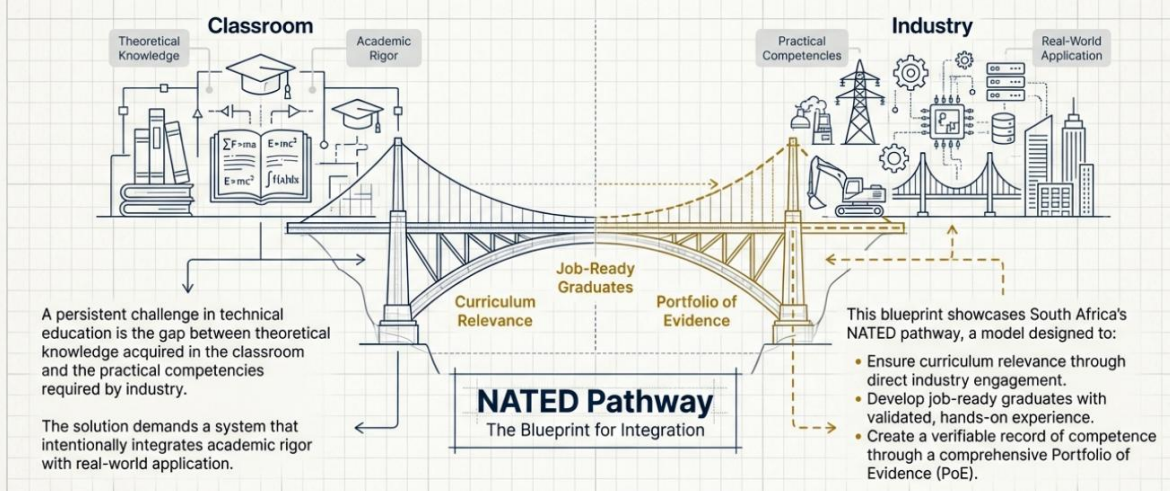
This presentation deconstructs the rigorous journey of Tshingombe Tshitadi through South Africa's NATED engineering qualification. It serves as a blueprint, illustrating how a structured framework of theory, practical immersion, and robust assessment builds a competent, certified professional ready to meet industry demands.



PROTAGONIST:
TSHINGOMBE TSHITADI

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The Core Challenge: Bridging the Gap Between Engineering Theory and Industry Demands



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The Regulatory Architecture: SAQA, the NQF, and DHET

South Africa's qualifications are built on a foundation of rigorous national standards, ensuring quality, portability, and credibility.



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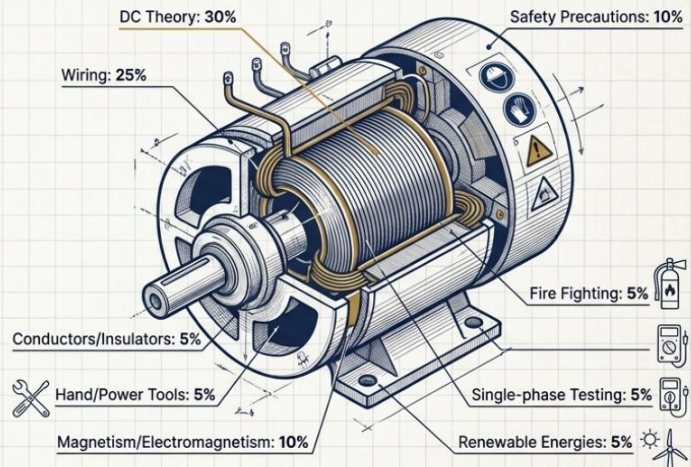
Phase 1: The Foundation – Building Core Competencies (N1–N3)

The journey begins with the N1 Certificate (SAQA ID 63375), establishing the essential theoretical and practical groundwork.

The curriculum for Electrical Trade Theory emphasizes core skills and safety from day one.

This structure ensures every student masters the fundamentals before advancing.

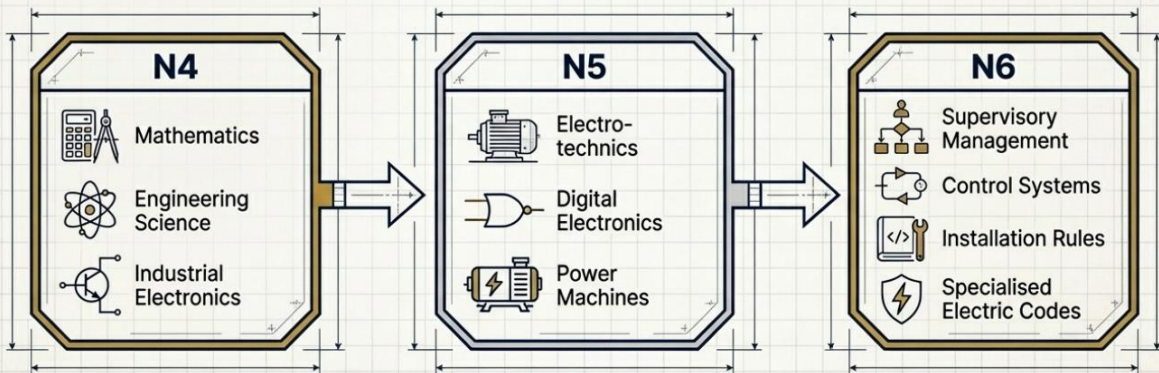
Key Module Weightings for Electrical Trade Theory



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Phase 2: The Framework – Constructing Advanced Technical Knowledge (N4–N6)

With the foundation secure, the learner progresses through N4, N5, and N6, each level building systematically on the last. This phase develops advanced technical knowledge and prepares the student for specialized industry roles. This structured academic progression is the theoretical backbone of the National N Diploma.



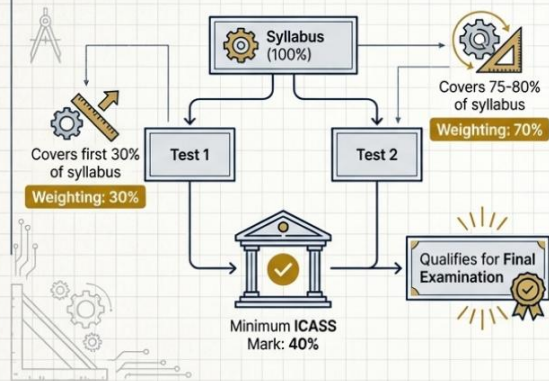
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The Engine of Assessment: The ICASS Model and Portfolio of Evidence

Competence is not just taught; it is rigorously assessed and documented. The NATED system relies on two core components for quality assurance:

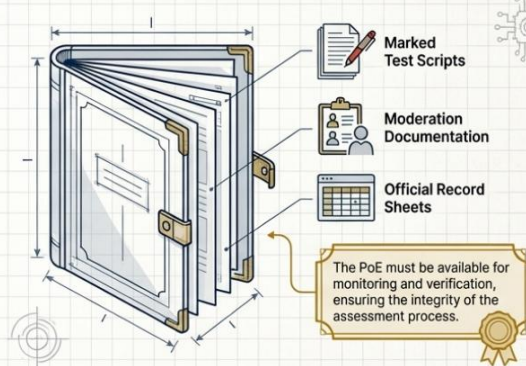
1. Internal Continuous Assessment (ICASS) - Report 191

A weighted, year-long assessment structure.



2. The Portfolio of Evidence (PoE)

The official, auditable record maintained by the lecturer.



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Upholding the Standard: The Dual Role of Student and Assessment Moderator

Tshingombe Tshitadi's journey is unique not only for his academic achievements but also for his role as a registered SASSETA Assessment Moderator. This dual perspective provides a deep understanding of the educational framework from both sides.

Moderator Responsibilities:

- ✦ Be a registered subject matter expert.
- ✦ Conduct pre- and post-assessment moderation to ensure fairness and technical accuracy.
- ✦ Moderate a minimum of 10% of scripts to verify marking consistency.
- ✦ Submit detailed reports to uphold the credibility of the qualification.

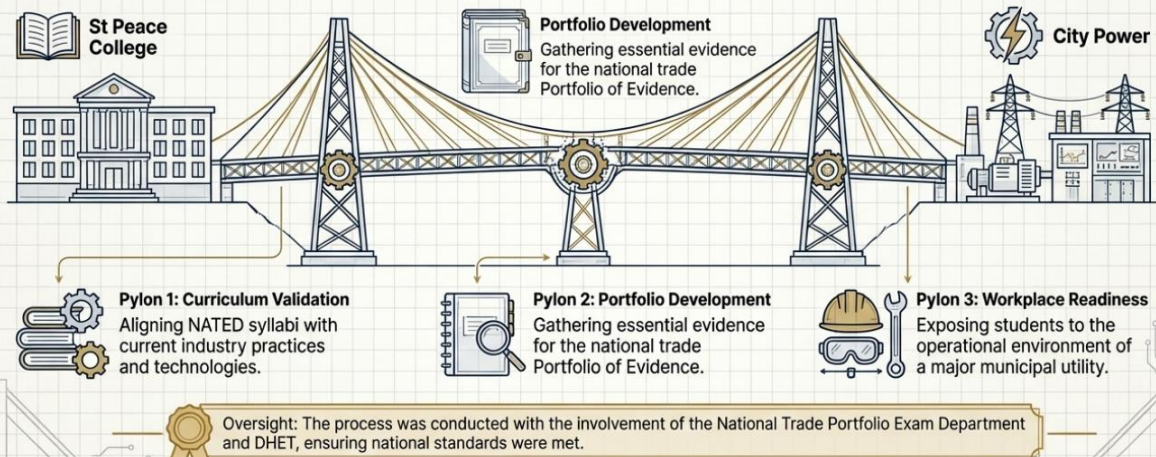
This commitment to quality assurance is a testament to true professional mastery.



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Phase 3: The Bridge to Industry – The Climax at City Power

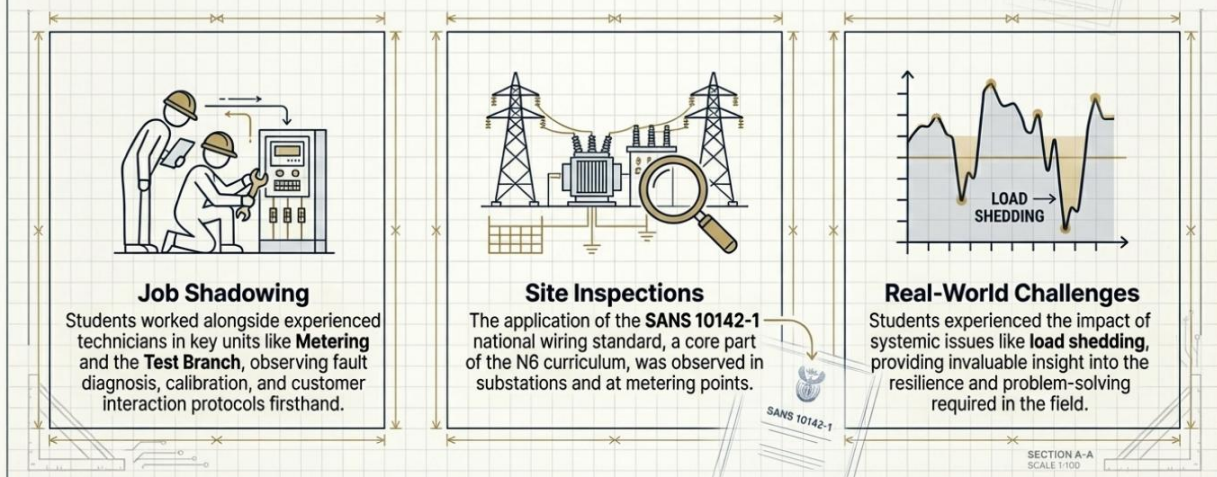
The NATED blueprint culminates in a structured immersion into the industry. A visit by students from St Peace College and other NATED institutions to City Power served as the critical link between classroom theory and practical reality.



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Theory Meets Practice: From SANS 10142-1 to a Live Electrical Grid

During the City Power immersion, theoretical knowledge was applied and tested in a live operational environment.

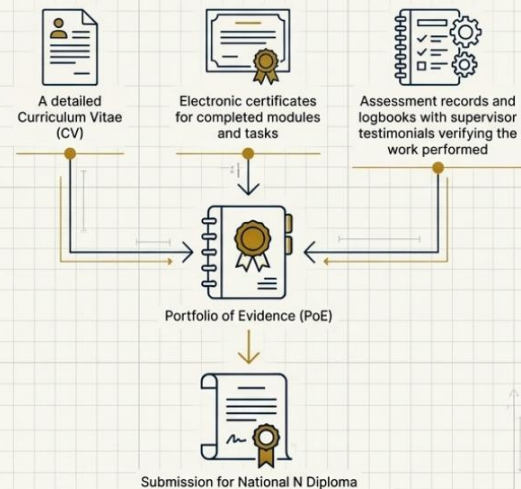


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Documenting Mastery: Building the National Trade Portfolio

The practical experience at City Power is not just for exposure; it is a formal requirement for qualification. The activities directly contribute to the student's **Portfolio of Evidence (PoE)** and **logbook**.

The PoE serves as the comprehensive, auditable proof that the learner has translated theoretical knowledge into demonstrated competence.



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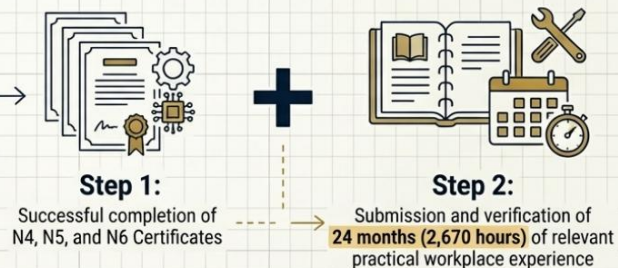
The Final Output: The National N Diploma in Engineering (NQF Level 6)

The successful completion of the entire NATED pathway, including both academic and practical components, results in the award of the National N Diploma.

Qualification Details

- **Official Title:** National N Diploma: Engineering Studies
- **SAQA Qualification ID:** 90674
- **NQF Level:** 6
- **Minimum Credits:** 360

Structure for Award



This qualification signifies a **professional** who is both **academically knowledgeable** and **industry-proven**.

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The Verified Record: A Synthesized Transcript of Achievement

Every step of the journey is documented and verifiable through the official DHET record, ensuring complete traceability.

Learner Record for Tshingombe Tshitadi		Synthesized Transcript Data			
SAQA Asset ID:	09121	Level	Subject/Module	Status	Assessment
SAQA Institution Code:	30_39	N1-N3	Electrical Trade Theory Foundation	Complete	ICASS/Exam
Assessment Policy:	IE099	N4	Mathematics, Engineering Science, Ind. Elec.	Complete	ICASS/Exam
Qualification SAQA ID:	90674 (National N Diploma Engineering)	N5	Electro-technics, Digital Elec., Power Mach.	Complete	ICASS/Exam
Learner IDs:	2004007064381, 2100002023812	N6	Sup. Management, Control Systems, Inst. Rules	Complete	ICASS/Exam
DHET Submission Status:	Submitted (as of 2024-02-12)	-	Practical Experience (24 Months)	Verified	Logbook/PoE
Timetable Reference:	/50111002	-	**Final Award: National N Diploma**	**Awarded	-

NotebookLM

The Verified Record: A Synthesized Transcript of Achievement

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Assessment Policy:	IE099	N4	Mathematics, Engineering Science, Ind. Elec.	Complete	ICASS/Exam
Qualification SAQA ID:	90674 (National N Diploma Engineering)	N5	Electro-technics, Digital Elec., Power Mach.	Complete	ICASS/Exam
Learner IDs:	2004007064381, 2100002023812	N6	Sup. Management, Control Systems, Inst. Rules	Complete	ICASS/Exam
DHET Submission Status:	Submitted (as of 2024-02-12)	-	Practical Experience (24 Months)	Verified	Logbook/PoE
Timetable Reference:	/50111002	-	**Final Award: National N Diploma**	**Awarded	-

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A Commitment to Continuous Professional Development

The National N Diploma is a cornerstone qualification, but true professionalism is defined by a commitment to lifelong learning and engagement with the broader industry. Tshingombe Tshitadi's record reflects this through multiple registrations and certifications.



Council on Higher Education:
Certificate of Record for Career Development.

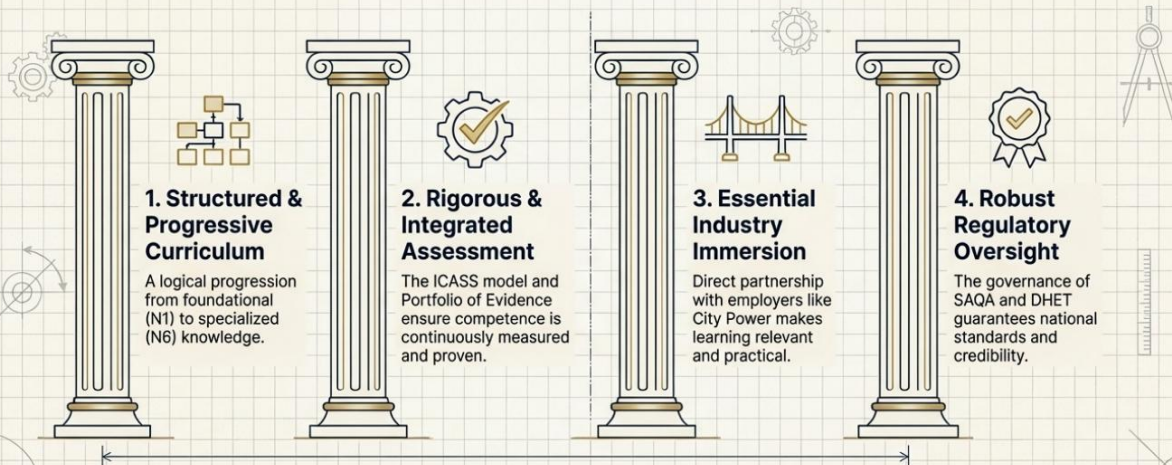
ECSA Portal Certificates: Engagement with the Engineering Council of South Africa's professional development platforms.

South African Council for Educators: Registration as an education professional.

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The Blueprint Deconstructed: The Four Pillars of Success

The NATED engineering pathway, as exemplified by this case study, is a successful model for developing industry-ready professionals. Its success rests on four essential pillars:



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From Blueprint to Bedrock: Building South Africa's Engineering Future

The rigorous, integrated, and industry-aligned NATED pathway is more than an educational program—it is the bedrock upon which South Africa's technical capability is built. By transforming students into competent, certified, and industry-ready professionals, this blueprint is fundamental to driving innovation and securing the nation's engineering future.

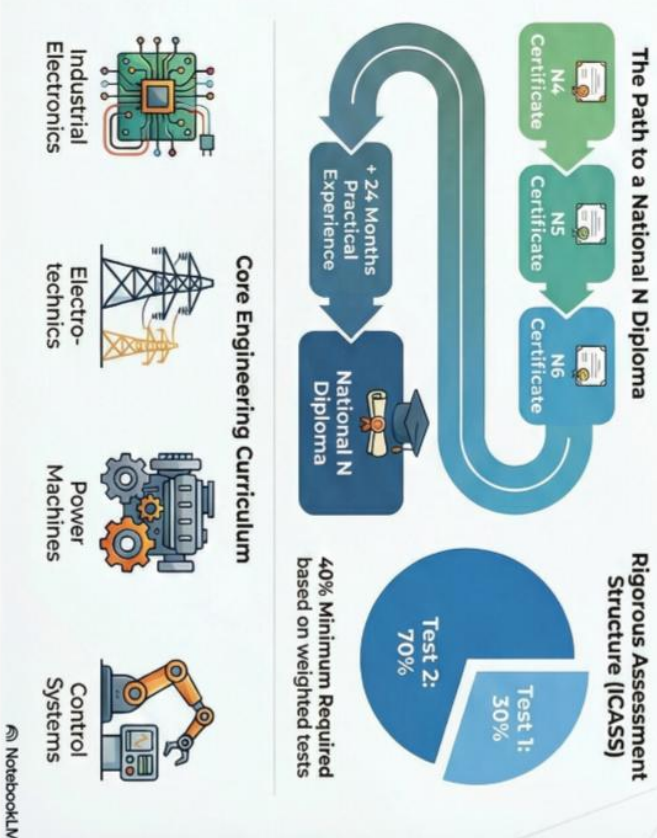
NotebookLM

Anatomy of an Engineering Qualification: A Learner's Journey

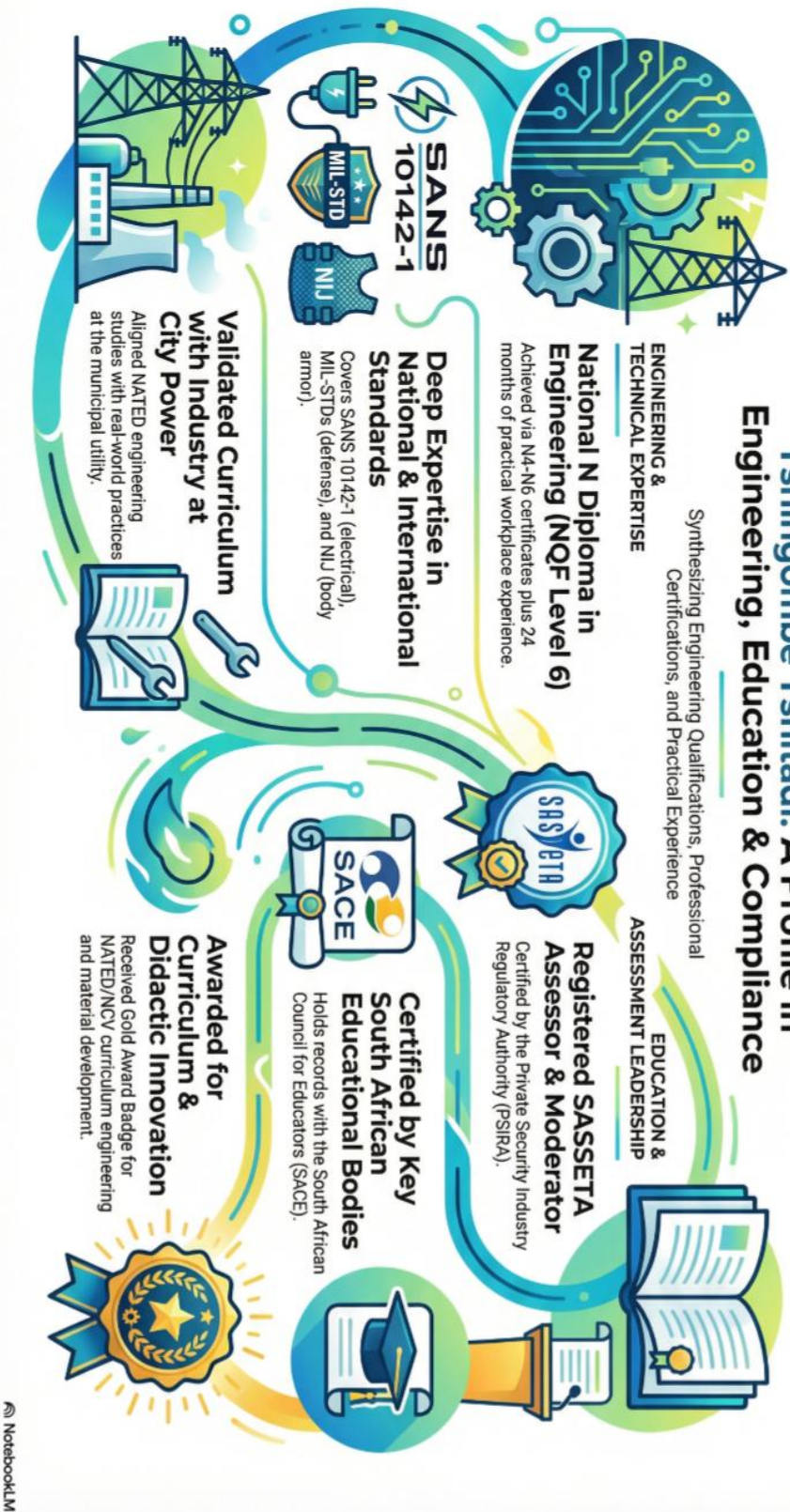
Learner Profile & Key Credentials



The NATED Qualification Framework



Tshingombe Tshitadi: A Profile in Engineering, Education & Compliance



Anatomy of an Engineering Qualification: A Learner's Journey



Learner Profile & Key Credentials

Tshingombe Tshitadi: Engineering Student & Assessment Moderator

Holds qualifications from institutions like St Peace College under various regulatory bodies



National N Diploma in Engineering (NQF Level 6)

A SAQA-registered qualification (ID 90674) requiring 380 minimum credits



Certified SASSETA Assessor Moderator

Registered with the Private Security Industry Regulatory Authority (PSIRA)

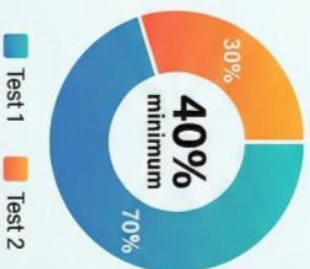


The NATED Qualification Framework

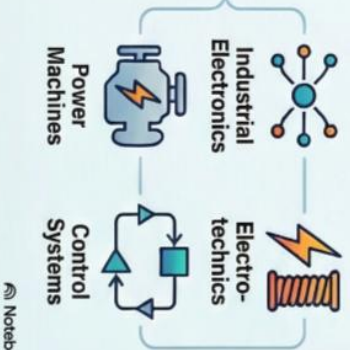
● The Path to a National N Diploma



● Rigorous Assessment Structure (ICASS)



● Core Engineering Curriculum



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The Engineer's Odyssey: A Systems Thinker's Approach to Solving South Africa's Challenges



A portfolio of evidence showcasing the integration of Electrical Engineering, Security Systems Analysis, and Educational Framework Design.

This presentation documents the journey of Tshingombe Tshitadi, an engineer who views South Africa's most pressing issues—from energy instability to public safety—not as isolated problems, but as interconnected systems requiring a multifaceted analytical approach.

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A Dual Foundation: Engineering Precision and Policing Principles.



Core Engineering Competencies Neue Haas Grotesk Display Bold

- Electrical Trade Theory
- Industrial Electronics
- Engineering Science & Drawing
- Mathematics
- Electrotechnology & Electrotechnics
- Practical Electrical Wiring & Construction

Frameworks for System Integrity Neue Haas Grotesk Display Bold

- Crime Scene & Incident Investigation
- Investigative Methods and Techniques
- Paralegal Low Justice
- Applied Policing & Crime Prevention
- Firearm Study Material & Forensics

Key Takeaway: Educated at St. Peace College and Africa Policing Institute, Tshingombe developed a unique perspective: how to build a system (engineering) and how to protect it (policing).

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Obstacles as a Catalyst for Deeper System Analysis

The journey to formal qualification encountered significant administrative hurdles within the national framework. These backlogs, rather than halting progress, sparked a rigorous investigation into the mechanics of the educational system itself.

SAQA Evaluation Files

`ref:\_00D205o40.\_5004JYEzA3:ref`
`SAQA APPLICATION 20191130002`
`202001305040/ 201911130002`

“Student name tshingombe : tshitadi applying for diploma engineering electrical study... waiting for result of your diplomat for to council and release your result hand over certificate.”

This experience transformed a personal challenge into an intellectual mission: to deconstruct and understand the systems governing education, assessment, and qualification.

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Deconstructing the System: A Portfolio of Educational Design

Exhibit A: Daily Lesson Plan

TOPIC

LEARNING OUTCOMES / OBJECTIVES

Resource activity

Teacher reflection / evaluation

Exhibit B: Assessment Rubric

Knowledge and Understanding	APPLYING	ANALYSE SYNTHESIS EVALUATION	INVESTIGATION	DISCOVERY/ DESIGN /	ASSESS

Exhibit C: Curriculum Framework

ELECTRICAL
ENGINEERING
TRADE THEORY
ELECTRICAL
INDUSTRIEL
ELECTRONICS
N1,N2,N3
SCIENCE
ENGINEERING

Insight: He didn't just study the curriculum; he reverse-engineered it. This demonstrates a deep, systemic understanding of how knowledge is structured, assessed, and validated within the TVET/DHET framework.

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Pillar I: Interrogating the South African Energy Crisis.

Problem Statement

South Africa's economic stability is inextricably linked to the reliability of its power grid. Persistent load shedding and infrastructure challenges at Eskom and City Power are not just technical failures, but complex systemic problems.

Tshingombe's Approach

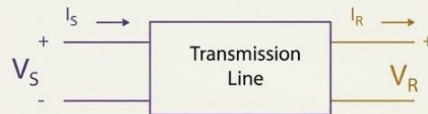
My research focuses on moving beyond temporary fixes to model and analyze the fundamental weaknesses in the grid, from generation to distribution.

Key Areas of Investigation

- Smart Grid Technology to reduce energy losses.
- Feasibility of Renewable Energy Integration (Solar, Wind).
- Grid Stability and Load Balancing under peak demand.
- Analysis of cascading failures leading to blackouts.



The Engineer's Toolkit: Applying First Principles to Grid Instability.



Quantifying Energy Loss

$$\text{Power Loss} = I^2 R$$

This fundamental law is used to calculate and pinpoint energy losses in Eskom's transmission lines, identifying critical areas for infrastructure upgrades.

Modeling System Resistance

$$R_T = R_0(1 + \alpha_{at})$$

Modeling how temperature affects the resistance of field coils in motors and generators, crucial for predicting equipment failure and maintenance needs.

Analyzing AC Power Flow

$$P = VI * \cos(\varphi)$$

Calculating the active power flow in the grid to assess system stability, manage load effectively, and improve the overall power factor for greater efficiency.

A Research Agenda for a Modernized Grid

Analysis extends to evaluating best-in-class global technologies and their applicability to the South African context.



Energy Optimization in Configured Systems

Compare the energy efficiency of systems configured using Schneider's simulation tools versus traditional methods to quantify potential operational savings for local infrastructure.



Sustainability in Product Usage

Investigate how Eaton's training on renewable solutions (solar inverters, energy-efficient transformers) can be adapted for upskilling South African technicians.

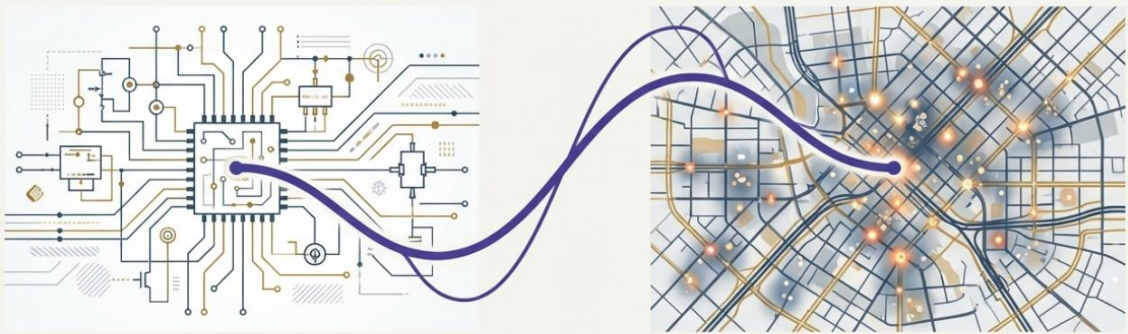


IoT Integration for Smart Grid Systems

Study how Azure IoT Edge devices can be configured to improve real-time energy distribution monitoring and fault detection on the City Power network.

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Pillar II: Engineering Security, Securing Systems



Central Assertion: A system, whether electrical or societal, is only as strong as its security. The principles of engineering—analysis, modeling, and fault detection—can be powerfully applied to the challenges of public safety and policing.



From Fault Detection to Crime Prevention:
Applying diagnostic thinking to identify patterns and predict points of failure in public safety.



From System Optimization to Resource Allocation:
Using data to deploy policing resources more effectively.



From Regulatory Frameworks to Rule of Law:
Understanding that both engineering and policing operate within strict, structured rule-based systems.

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A Quantitative Approach to Crime Analysis.

Moving beyond traditional methods to apply a data-driven framework for investigation and incident analysis.

1. Statistical Reporting

“statistic report : carmine academic excel, guard repor number attendance ,number complain, number probability, investigation ruling statistic point...”

2. Geospatial & Temporal Analysis

“...coordination x, y map show,, graphical, name bridge adess brigade complain poin equation coordinate matrice line colone complain...”

3. Predictive Modeling

“...investigation histogram equation quadratic, plot math curriculum time came outcome , investigation event action going...”

This methodology transforms incident reports from simple narratives into a multi-dimensional dataset, enabling predictive analysis and strategic intervention.

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Pillar III: Building Human Capital—The Core of Any System

Advanced technology and robust security frameworks are ineffective without the skilled professionals to build, maintain, and operate them. The most critical infrastructure is a well-educated workforce.

From DHET/SAQA Analysis:
My investigation into educational backlogs led to a framework for improving TVET curriculum design and assessment to better align with industry needs (MERSETA, SASSETA).

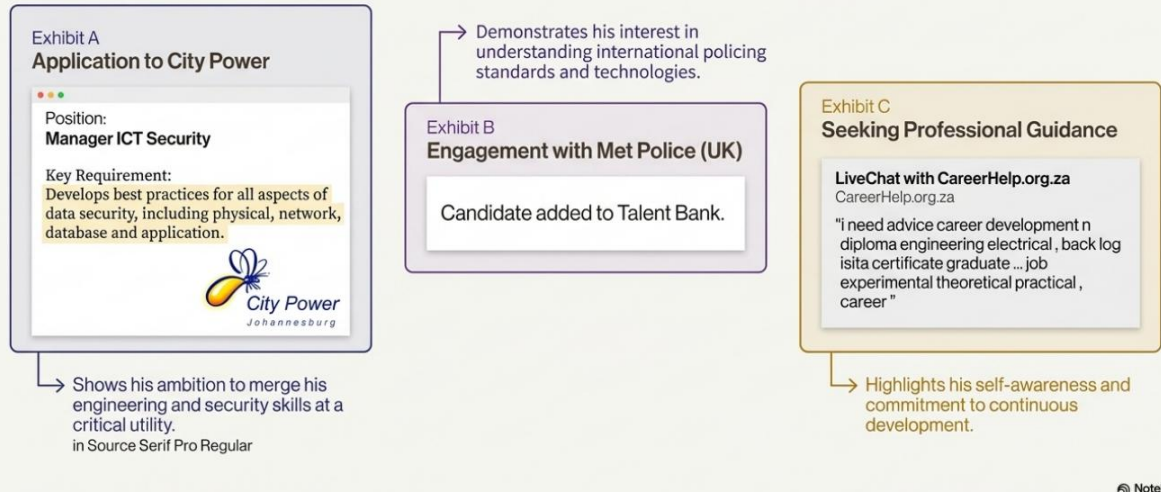
From Eskom/Eaton Research:
Analysis of corporate training models reveals pathways for creating effective mentorship and bursary programs that address critical skill gaps in the energy sector.

Synthesis:
A holistic national strategy must integrate technical training, safety protocols, and continuous professional development.

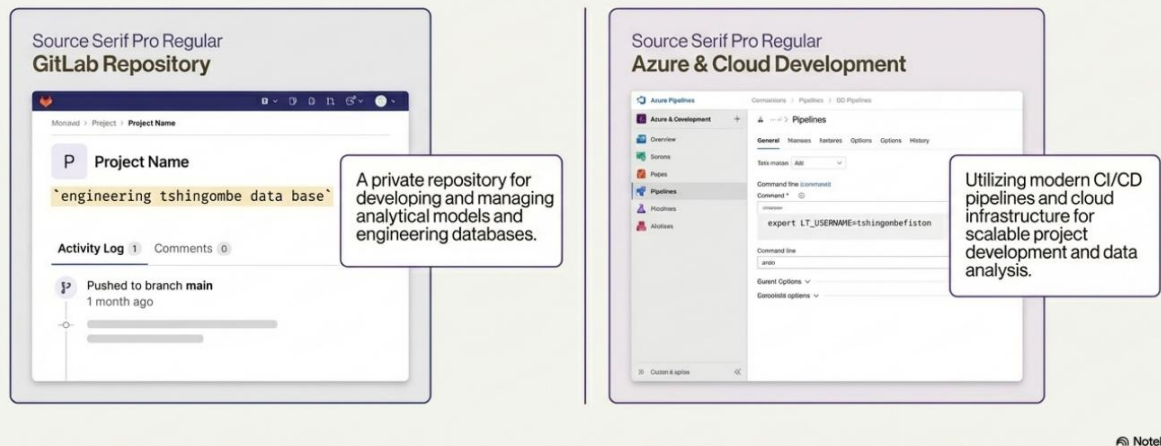
The diagram consists of three overlapping circles. The top circle is orange and labeled 'Technical Systems (Energy)'. The bottom-left circle is purple and labeled 'Security Protocols (Policing)'. The bottom-right circle is blue and labeled 'Human Development (Education)'. The central area where all three circles overlap is labeled 'National Resilience'.

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The Drive to Apply: Seeking to Contribute to National Systems.



Building the Tools: The 'Kananga5' Digital Workspace.



A Vision for a Resilient and Efficient South Africa.



My purpose is to leverage a unique synthesis of skills to address South Africa's systemic challenges:

- 1. Re-engineering the Energy Grid**
Applying rigorous analysis and modern technology to build a stable, efficient, and sustainable power infrastructure.
- 2. Implementing Data-Driven Security**
Transforming public safety through quantitative analysis, predictive modeling, and the integration of technology into policing.
- 3. Architecting Human Potential**
Designing and refining educational and training frameworks that produce the next generation of skilled engineers and system guardians.

This is not three separate career paths. It is one integrated mission.

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Tshingombe Tshitadi

Systems Analyst | Electrical Engineer | Security Framework Designer

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Phone: 0725298946

View Projects & Research

gitlab.com/Kananga5

Building • Analyzing • Securing

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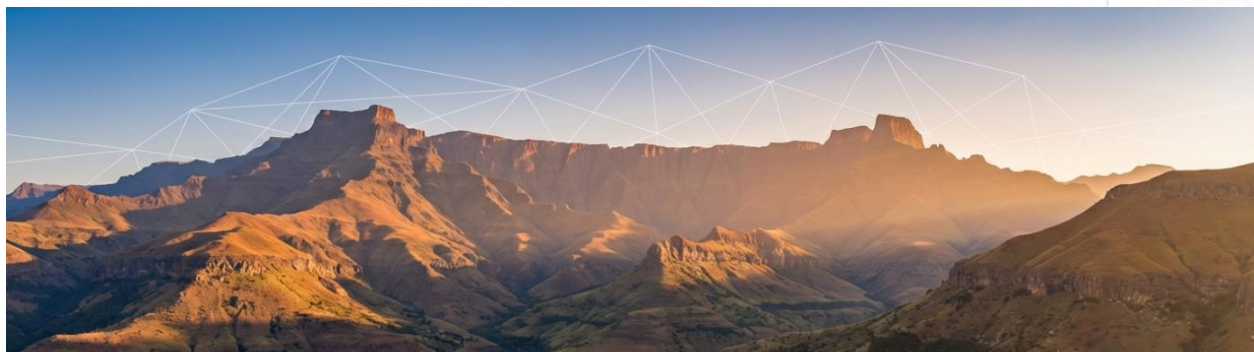
The Persistent Engineer

A Journey of Skill, Resilience, and Vision in South Africa's Energy Sector

Name: Tshingombe Tshitadi

Core Expertise: Electrical Engineering, Systems Analysis,
Security Integration

Contact: tshingombefiston@gmail.com | +27 72 529 8946



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Engineering a Reliable and Sustainable Energy Future for South Africa

My journey is driven by a commitment to solving complex challenges in the electrical engineering field. I leverage deep technical knowledge, a resilient character forged through adversity, and a systems-based approach to build a more reliable and sustainable energy future for the nation.



Lifelong Learning: A continuous pursuit of knowledge across disciplines.



Practical Application: Bridging theory with real-world implementation.



Systemic Problem-Solving: Understanding and addressing interconnected challenges.

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A Comprehensive Foundation in Electrical Engineering

A summary of the core theoretical and practical knowledge gained through the N1-N6 Electrical Engineering studies.



Circuit Analysis & Electronics

- Ohm's & Kirchhoff's Laws
- RLC Circuits & AC/DC Theory
- Series & Parallel Installations
- Thermoelectric Cooling (Peltier Elements)



Power Systems

- Generation, Transmission & Distribution
- Transformers (Single-phase & Three-phase)
- Switchgear & Protective Devices (Induction Disc Relays)
- Fault Analysis & Symmetrical Components



Digital Systems & Logic Design

- Binary Systems (Bits, Bytes, Nibbles)
- Boolean Algebra & Bitwise Operators (AND, OR, XOR)
- Karnaugh Mapping (SOP & POS simplification)



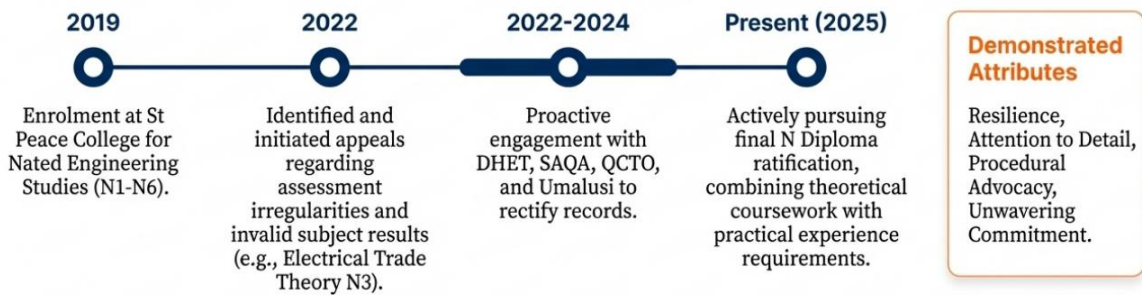
Applied Mathematics & Physics

- Differential Equations for Circuit Analysis (e.g., $L \frac{d^2}{dt^2} + R \frac{di}{dt} + \frac{1}{C} = \text{linear}$)
- Electromagnetism & Conductor Physics
- Applied Thermodynamics (Heat Transfer, Steam Generators)

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A Record of Perseverance: Navigating Systemic Hurdles

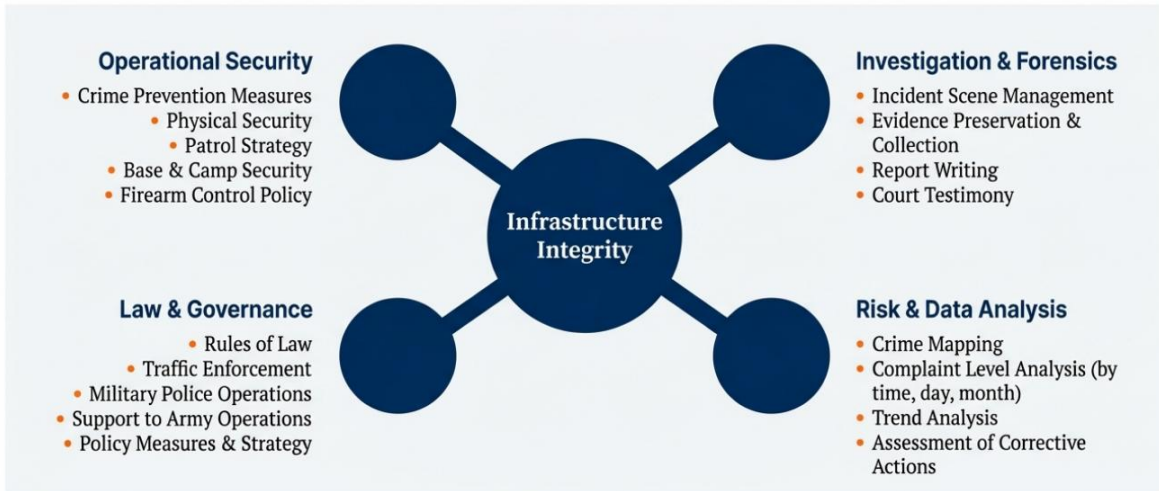
Successfully navigating the complexities of academic administration, including assessment irregularities and qualification backlogs, has honed my skills in advocacy, documentation, and procedural diligence. This experience demonstrates a deep commitment to fair process and achieving stated goals despite obstacles.



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Integrating Engineering with Security & Governance

A modern engineer must understand the systems they operate within. My studies extend to policing, security, and risk management, providing a unique perspective on infrastructure protection, operational integrity, and policy implementation.



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The Modern Engineer's Toolkit: From Theory to Implementation



Design & Documentation

- Engineering Drawing & Geometrical Construction
- Computer-Aided Design (CAD)
- Interpreting Manufacturer Specifications & Site Plans
- Technical Documentation & Report Writing



IT & Data Systems

- Network Architecture Principles (Azure, GitHub)
- Information Management Systems (Police Station & Student Databases)
- Cybersecurity Principles for Smart Infrastructure
- Microsoft Tools (Excel for reporting, Visual Studio for deployment)



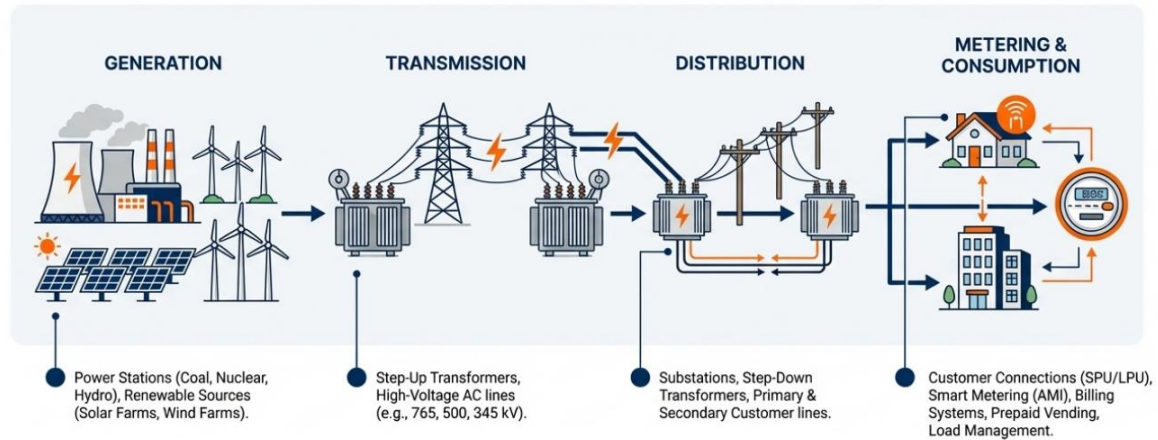
Project Execution

- Project Framework & Qualification Implementation
- Assessment & Moderation Policies
- Stakeholder Communication (Verbal & Non-Verbal)
- Workplace Communication (Work Orders, Change Orders, Memos)

NotebookLM

Understanding the Grid: From Generation to Consumption

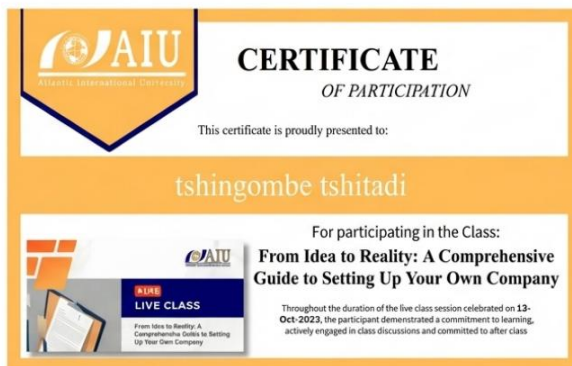
A concise explanation of the end-to-end electrical power system, referencing key players like Eskom and City Power.



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Building the Future: The Entrepreneurial Vision

Beyond seeking a role, I am building a vision. My entrepreneurial studies and the founding of 'Tshingombe Tshitadi Engineering' reflect a drive to create innovative solutions and contribute directly to the industry.



Continuing Education

Certificate of Participation

Class: 'From Idea to Reality: A Comprehensive Guide to Setting Up Your Own Company'

Institution: Atlantic International University (AIU)

Date: 13-Oct-2023

Company Registered

Name: Tshingombe Tshitadi Engineering

Tax Reference Number: 9722328238

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Ready to Contribute: Key Areas of Impact



Smart Grid Development

Improving grid reliability and efficiency through the design and implementation of Advanced Metering Infrastructure (AMI), data analysis, and modern control systems.



Critical Infrastructure Security

Applying a systems-thinking approach that integrates physical security measures, crime prevention strategies, and cybersecurity principles to protect critical assets from threats.



Renewable Energy Integration

Providing technical expertise in the design, planning, and project management required to integrate renewable sources (solar, wind) into the existing grid, supporting a just and sustainable transition.



Operational Efficiency & Revenue Recuperation

Leveraging data management and process control skills to reduce technical and non-technical losses, improve billing accuracy, and support revenue collection efforts as seen with City Power.

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The Engineer for the Future: Resilient, Multi-Disciplinary, and Mission-Driven

The challenges facing South Africa's energy sector require more than traditional engineering. They demand a new approach—one that combines deep technical knowledge with an understanding of security, policy, and data systems. My journey has uniquely equipped me with this multi-disciplinary toolkit, ready to build a more resilient and efficient energy landscape.

Tshingombe Tshitadi • tshingombefiston@gmail.com • +27 72 529 8946 • GitHub: Kananga5

NotebookLM

The Persistent Engineer

A Journey of Skill, Resilience, and Vision in South Africa's Energy Sector



	Name: Tshingombe Tshitadi
	Core Expertise: Electrical Engineering, Systems Analysis, Security Integration.

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Engineering a Reliable Future for South Africa



My journey is driven by a commitment to solving the complex challenges in South Africa's energy landscape. This requires more than just technical knowledge; it demands a resilient, systems-based approach to build a more reliable and sustainable future, addressing issues from loadshedding to aging infrastructure.



Lifelong Learning

Embracing continuous growth to stay ahead of evolving technologies.



Practical Application

Translating engineering theories into tangible, effective solutions.



Systemic Problem-Solving

Navigating intricate systems to identify root causes and optimize performance.

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The Blueprint: A Foundation in Electrical Engineering



Circuit Analysis & Theory

- Ohm's & Kirchhoff's Laws (KVL/KCL)
- RLC Circuit Analysis & Differential Equations ($L \cdot \frac{d^2}{dt^2} + R \cdot \frac{di}{dt} + 1/c$)
- AC/DC Power Calculations ($P=VI$, $P=I^2R$)



Power Systems & Machinery

- Generation, Transmission & Distribution
- Transformers (Primary & Secondary)
- Three-Phase AC Systems & Synchronous Generators



Digital Logic & Electronics

- Boolean Algebra & Binary Systems (Bits, Nibbles, Bytes)
- Karnaugh Mapping for Logic Simplification
- Microcontrollers & Industrial Electronics



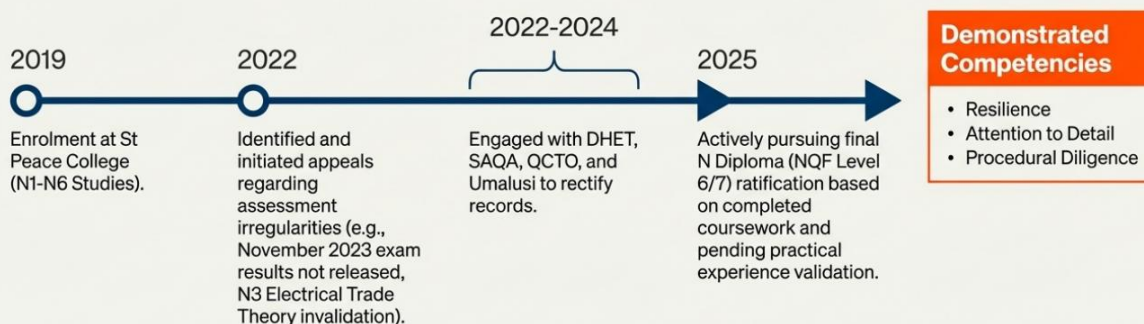
Applied Mathematics & Physics

- Electromagnetism & Thermodynamics
- Signal Processing (Z-transform, Filter Design)
- Strength of Materials & Mechanical Properties

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Navigating Systemic Hurdles: A Record of Perseverance

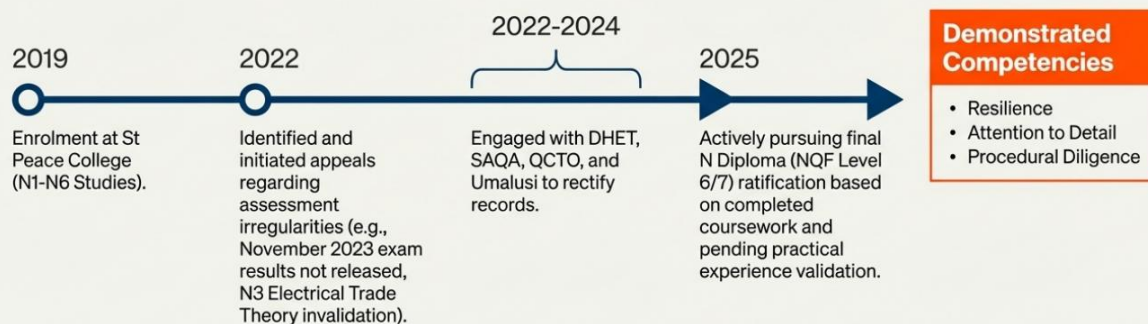
Successfully navigating the complexities of academic administration, including assessment irregularities and qualification backlogs, has honed my skills in advocacy, documentation, and commitment to fair process.



NotebookLM

Navigating Systemic Hurdles: A Record of Perseverance

Successfully navigating the complexities of academic administration, including assessment irregularities and qualification backlogs, has honed my skills in advocacy, documentation, and commitment to fair process.



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Integrating Engineering with Security & Governance

A modern engineer must understand the systems they operate within. My studies in policing, security, and risk management provide a unique perspective on infrastructure protection and operational integrity.

Risk Management

- Threat & Risk Assessment
- Crime Mapping & Data Analysis
- Proactive Policing Strategies



Operational Security

- Crime Prevention Strategies
- Physical Security Measures
- Patrol & Response
- Access Control

Law & Governance

- Rules of Law
- Traffic Enforcement & Collision Investigation
- Firearm Control Policy
- Military Police Operations



Investigation & Forensics

- Incident Scene Management
- Evidence Preservation & Collection
- Report Writing
- Court Testimony



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The Modern Engineer's Toolkit: From Theory to Implementation



Design & Documentation

Engineering Drawing
(Orthographic, Isometric) &
Geometrical Construction

Computer-Aided Design
(CAD)

Reading and Applying
Manufacturer Specifications

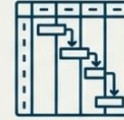


IT & Data Systems

Network Architecture & Cloud
Platforms (Azure, GitHub)

Information Management &
Database Systems

Cybersecurity Principles for
Smart Infrastructure



Project Management & Professional Practice

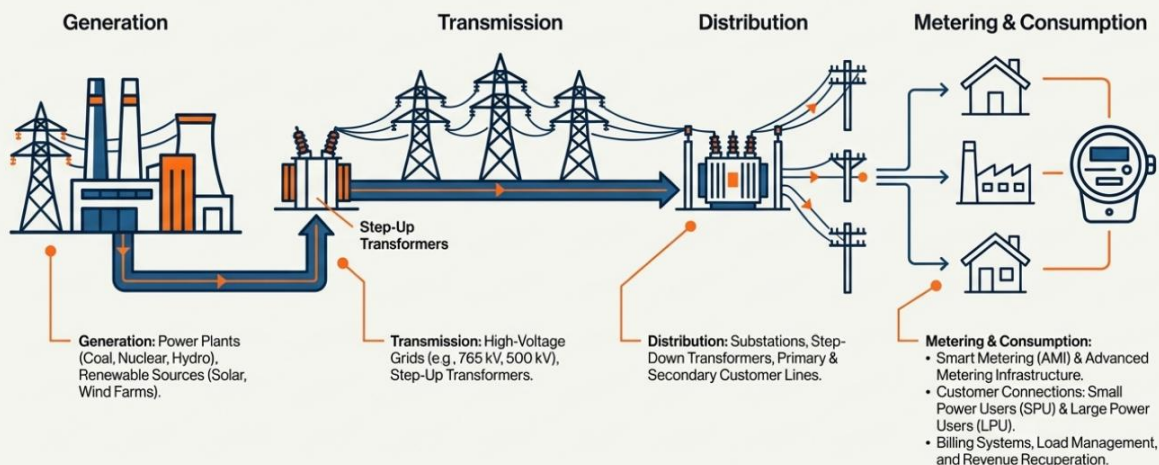
Project Frameworks &
Qualification Implementation

Assessment, Moderation, and
Quality Assurance

Stakeholder Communication &
Writing Job Documents (Work
Orders, Reports)

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Understanding the Grid: From the Generating Station to the Smart Meter



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Building the Future: Tshingombe Tshitadi Engineering

Beyond seeking a role, I am building a vision. My entrepreneurial studies and the founding of "Tshingombe Tshitadi Engineering" reflect a drive to create innovative solutions and contribute directly to the industry's evolution.



Evidence & Credentials

Company Registered: Tshingombe Tshitadi Engineering

Tax Reference Number: 9722328238

Certificate of Participation

"From Idea to Reality: A Comprehensive Guide to Setting Up Your Own Company"
Atlantic International University (13 Oct 2023)

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Ready to Contribute and Add Value

	Smart Grid Development Improving grid reliability and efficiency through smart metering (AMI), data analysis, and modern control systems.		Infrastructure Security Applying a systems-thinking approach to protect critical assets from physical and cyber threats, integrating engineering with security protocols.
	Renewable Energy Integration Providing technical expertise and project management for the integration of solar, wind, and other sustainable energy sources into the national grid.		Operational Efficiency Developing strategies for reducing technical and non-technical losses and improving revenue recuperation through better data management and process control.

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Let's Connect

Name: Tshingombe Tshitadi

✉ Email: tshingombefiston@gmail.com

☎ Phone: +27 72 529 8946

👤 Professional Profiles: GitHub: Kananga5

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sources above.

Once you have gathered these documents, you can list them formally in your CV under a "Certifications & Licenses" section.

The Professional Blueprint of Tshingombe Tshitadi Fiston

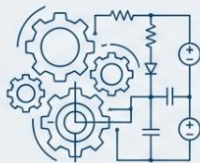
A Comprehensive Case for the Validation of a Multi-Disciplinary Expert in Engineering, Technology, and Security

Evidence Dossier: SAQA/DHET Review

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An Evidence-Based Case for Full Qualification Recognition

This presentation consolidates extensive documentation to validate Mr. Tshingombe Tshitadi Fiston as a **highly qualified, multi-disciplinary professional**. The evidence demonstrates **mastery** of core Electrical Engineering principles, **proficiency** in adjacent high-value fields, and **unwavering perseverance** in the pursuit of formal recognition.



Pillar I: Foundational Engineering Expertise

A complete N1-N6 Electrical Engineering education, supported by deep technical knowledge and extensive practical experience.



Pillar II: Interdisciplinary Proficiency

Proactive and certified expansion into Information Technology, Data Systems, Systems Engineering, Security, and Forensic Investigation.



Pillar III: A Documented Pursuit of Recognition

A meticulous record of engagement with qualifications authorities, presenting a robust, quasi-legal case for fair evaluation and the resolution of documented irregularities.

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A Trajectory of Continuous Learning and Professional Development



Pillar I: Foundational Expertise in Electrical Engineering

Completed N1-N6 NATED Studies in Electrical Engineering



Institution:
St. Peace College

Qualification Path:
National Certificate N1 through N6,
Electrical Engineering

Key Subjects Studied:

- Electrotechnology / Electrotechnics
- Industrial Electronics
- Engineering Science
- Mathematics
- Engineering Drawing

Supporting Evidence Mentioned in Dossier: Academic Transcript (Ref: 210002023812), Statement of Results N1-N6, 'Result 202311 release, pass all subject letter qualifications.'

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Pillar I: Foundational Expertise in Electrical Engineering

A Blueprint of Advanced Technical Knowledge

Power Systems & Circuit Theory

"AC/DC machine, instrument, energy power transmission generation cogeneration." Key formulas include:

$$P = 3 \times I \times I \times \cos\phi \text{ [W]}$$

$$X_L = 2 \times \pi \times f \times L, X_C = 1 / (2 \times \pi \times f \times C)$$

Fault Calculation & System Design

'Fault calculation check break application,' 'Design distributor system.' Calculations such as:

$$I_{3\text{phase}} = I_B / X, \text{ where } I_B \text{ is base}$$

Industrial Electrician Trade Knowledge

'Trade advance,' "Maintains hand tools, modified portable power tools," "Installer wiring cabling and termination," "Install low voltage system."

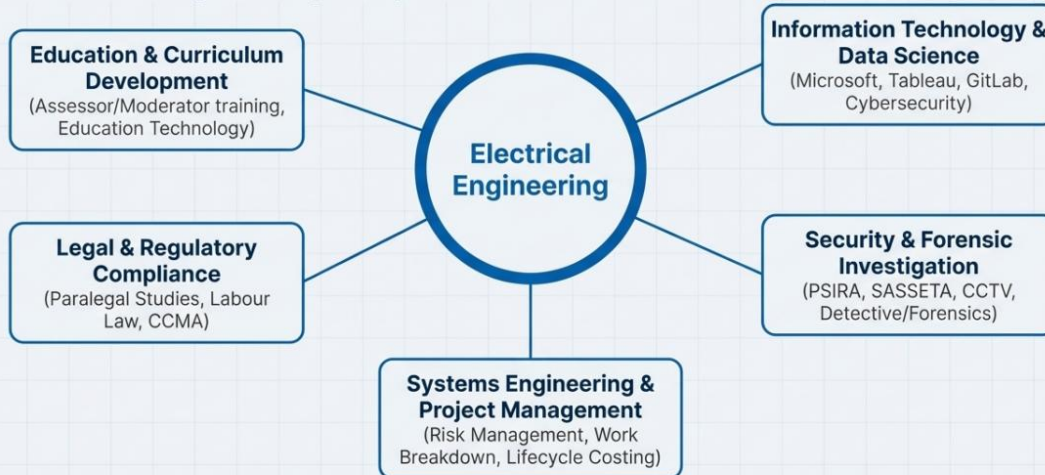
Systems Engineering & Control

"Introduction to systems engineering management," "Functional analysis and allocation," "Design synthesis," "Risk management."

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Pillar II: Interdisciplinary Proficiency

Expanding the Blueprint: A Portfolio of Cross-Disciplinary Expertise



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Pillar II: Interdisciplinary Proficiency

Certified Competency in Modern IT, Data, and Cloud Platforms



- **Data Engineering:** "Completed introduction data engineering," analysis of energy consumption data using Salesforce.
- **Software & Development:** Experience with Visual Studio, C Programming for microcontrollers, GitLab for repository management ("Manage, plan, code, building, secure, deployed, operate, monitoring").
- **Cybersecurity:** Microsoft Security training, ISC2 Candidate, research into "Cyber-Physical Systems," and network security.
- **Data Analysis & Visualization:** Tableau Blueprint assessment completion ("creating data culture," "deployment monitor maintenance").

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Pillar II: Interdisciplinary Proficiency

Specialized Knowledge in Security, Policing, and Forensic Technology



Formal Training

Alison Diplomas: Security, Body Guard, CCTV, Detective Police Forensic.

Regulatory Compliance: PSIRA & SASSETA learning verification.



Core Security Competencies

Physical Security: Access Control, Electrical Fence, Alarm Systems, Fire Prevention.

Investigation: Criminal Investigation, Corporate Investigation, Crime Scene Search, Interview Skills.

Technical Security: 'security technology,' 'surveillance, CCTV camera detector,' 'X ray.'



Formal Engagement

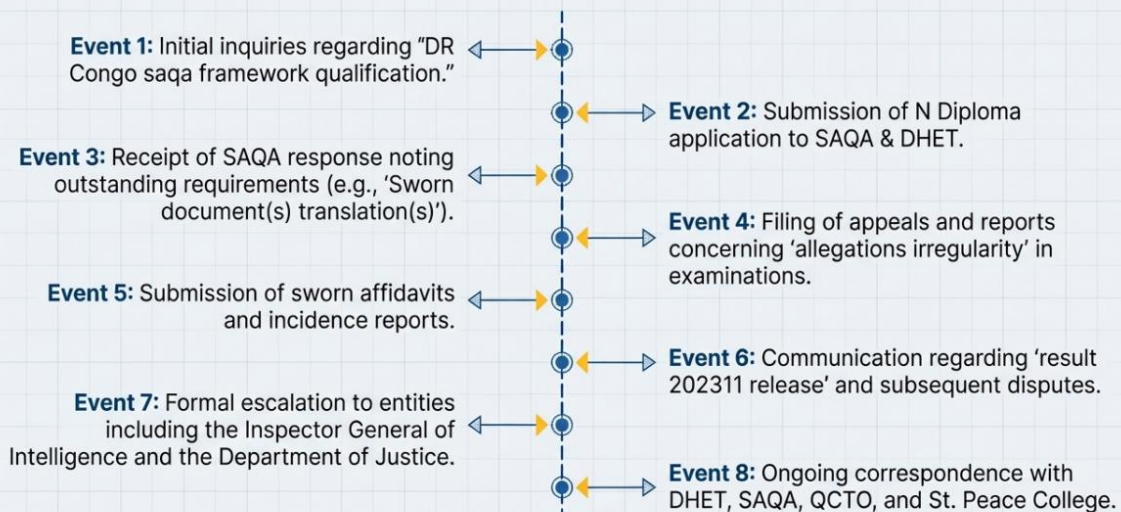
Submission of Intellectual Property (IP) license request to the UK Metropolitan Police (Ref: MIO 327,24- 0100).

Research and coursework in 'Police management information system,' 'law enforcement record system,' and 'real time crime record management system for national security.'

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Pillar III: The Documented Case for Recognition

A Timeline of Proactive Engagement for Formal Validation



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Pillar III: The Documented Case for Recognition

Exhibit A: Summary of Documented Irregularities

Assessment & Examination

- 'Allegations irregularity letter'
- 'Record academic transcript irregularity' (Ref: 210002023812)
- 'Irregularity time table. engineering'
- 'Correctional papper schedul error'

Institutional Conduct

- 'Irregularity lecture'
- 'Irregularity meeting classes and faculty'
- 'Irregularity internal assessment external'

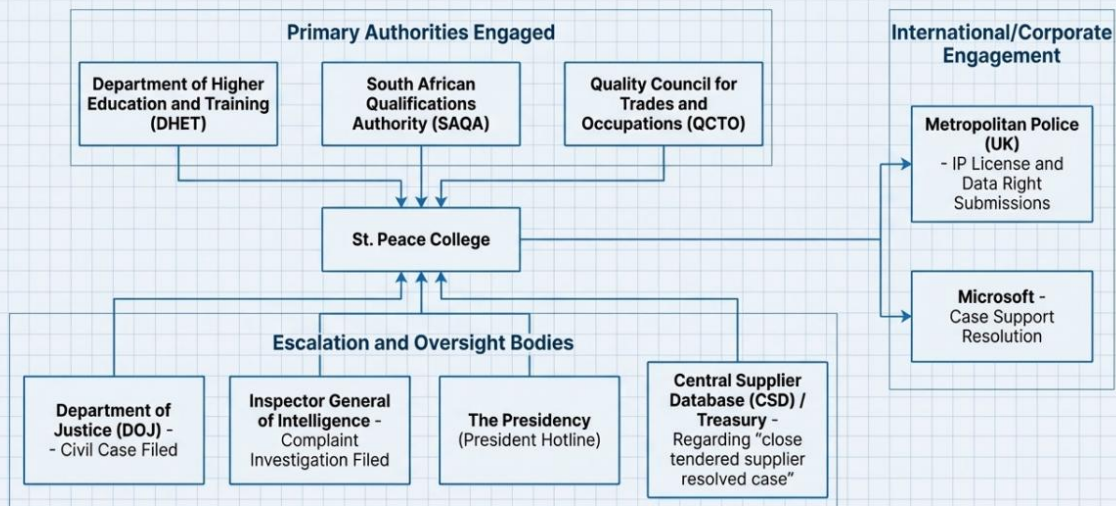
Process & Procedure

- 'Reasoning for irregularities no submitted'
- 'Record transcription irregularity'
- 'Incidence report resolve complain'
- Failure to release 'finalized n diplomat studies engineering electrical'

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Pillar III: The Documented Case for Recognition

Exhibit B: A Record of Formal Recourse and Escalation



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Synthesizing the Evidence: A Profile of Competence and Perseverance



Demonstrated Foundational Mastery

Successfully completed N1-N6 Electrical Engineering curriculum, supported by an advanced, practical understanding of complex engineering principles from power systems to industrial electronics.



Proven Interdisciplinary Proficiency

Proactively acquired certified skills in high-demand fields, including Microsoft data engineering, Tableau data analysis, cybersecurity (ISC2), and forensic investigation.



Unwavering Commitment to Due Process

Has meticulously documented and pursued the resolution of academic and administrative irregularities through all appropriate channels, demonstrating resilience and a profound respect for procedural fairness.

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The Path Forward: A Request for Formal Review and Validation

Based on the comprehensive evidence presented, we request the committee consider the following actions to ensure a fair evaluation and formal recognition of Mr. Tshingombe's qualifications.

1. A **full and impartial review** of the consolidated evidence contained within the '**Flip Portfolio**.'
2. An official **investigation** into the documented administrative and examination irregularities.
3. The **formal combination** of N1-N6 results and the awarding of the **National N Diploma in Electrical Engineering**, as per DHET procedure for candidates with sufficient practical experience.
4. **Formal recognition** of his extensive, certified learning in adjacent fields as evidence of continuing professional development and advanced capability.

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Appendix: Selected Advanced Coursework and Research Topics

Engineering & Technology

- ⊕ Specialist Engineering in Infrastructure: Electrochemical Engineering
- ⊕ Advanced Electrical Engineering in Construction and Civil Engineering
- ⊕ Cyber-Physical Systems and Information Technology
- ⊕ Immutable Data Storage Solutions for Web Design
- ⊕ AGI in Human-Machine Collaboration

Systems & Management

- ⊕ Advanced Diploma in Principles of Engineering System Design
- ⊕ Project Management in Electrical Engineering
- ⊕ Supply Chain Digitalization & Traceability
- ⊕ Police Management Information Systems
- ⊕ Mining Geotechnical Engineering

Emerging Fields & Applications

- ⊕ Neurotechnology in Educational Technology
- ⊕ Decentralized Finance (DeFi) & Blockchain Applications
- ⊕ Deep Learning and Neural Networks
- ⊕ Online Retail and E-commerce in the Renewable Energy Sector
- ⊕ Autonomous Vehicle Engineering and Renewable Energy Integration

The Architecture of Verifiable Mastery

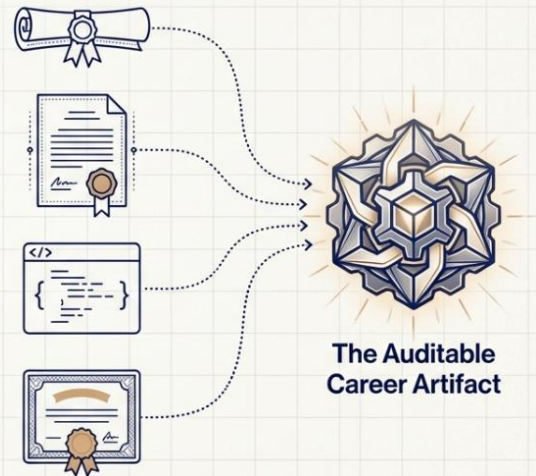
A System for Building, Auditing, and Certifying a Modern Technical Career

This is not a portfolio. It is a complete, auditable dossier reverse-engineering the pathway to transdisciplinary expertise.

In a world of fragmented qualifications and complex systems, how do we prove competence?

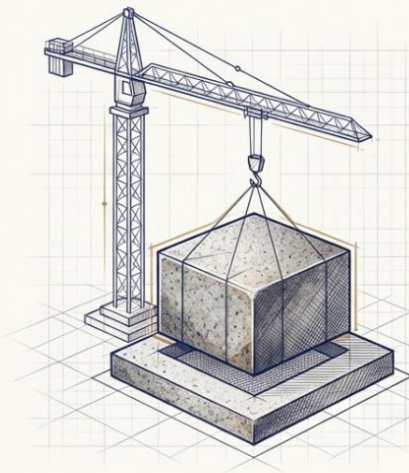
The modern technical career operates at the intersection of deep skill, stringent regulation, and rapid technological change. Traditional credentials are often disconnected, difficult to verify, and slow to adapt. This creates risk for employers, regulators, and the professionals themselves.

The Solution: We need a new artifact: a single, self-validating, and entirely auditable system that synthesizes every component of a career into a cohesive, verifiable whole.



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LAYER 1: The Bedrock of Technical Competence



Before a career can be compliant, secure, or innovative, it must be technically sound. This foundation is built on a rigorous, occupationally-focused qualification that closes the gap between theory and industrial reality.

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The National N Diploma: An Occupation-Focused Cornerstone

- **NQF Level 6:** Equivalent to advanced certificates and diplomas.
- **Occupational Focus:** Overseen by the Quality Council for Trades and Occupations (QCTO), designed to prove practical capability, not just theoretical knowledge.
- **Rigorous Pathway:**



Key Takeaway: The work experience requirement is the critical barrier that formally transforms 'book smarts' into 'industry ready' competence.

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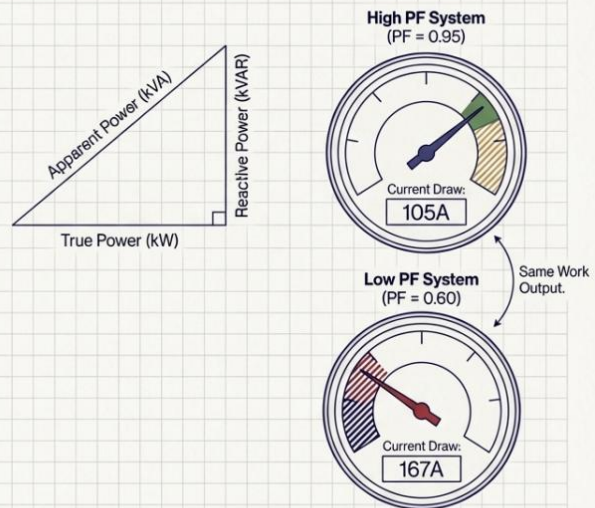
Mastery of Theory with Real-World Economic Impact: The Power Factor

****Definition**:** Power Factor (PF) is the ratio of True Power (kW) to Apparent Power (kVA). It measures the efficiency of an electrical system.

****Why It Matters**:** A low PF is an economic disaster. To get the same work done, a low PF system must draw significantly more current from the grid. This results in:

- Higher heat (I^2R losses)
- Equipment strain
- Significant financial penalties from utility providers like Eskom and City Power.

****The Technical Fix**:** The classic solution—adding capacitors—is shown to be a direct technical and economic necessity.

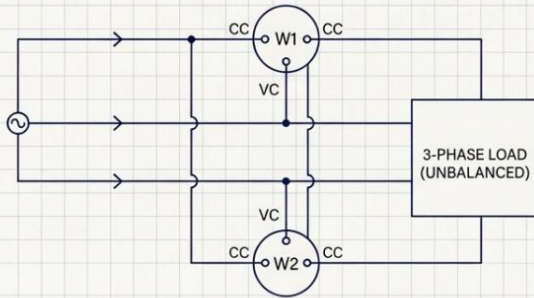


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Proving Deep Diagnostic Skill Beyond a Reliance on Digital Screens

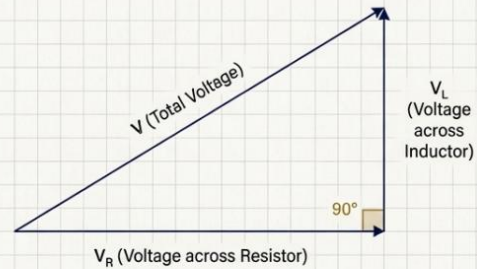
Featured Technique: The Two-Wattmeter Method

While seemingly "old school," this method accurately measures 3-phase power in 3-wire systems, even under unbalanced loads. Crucial for troubleshooting in older industrial plants where modern digital metering is unreliable or absent. It proves diagnostic mastery, not just an ability to read a screen.



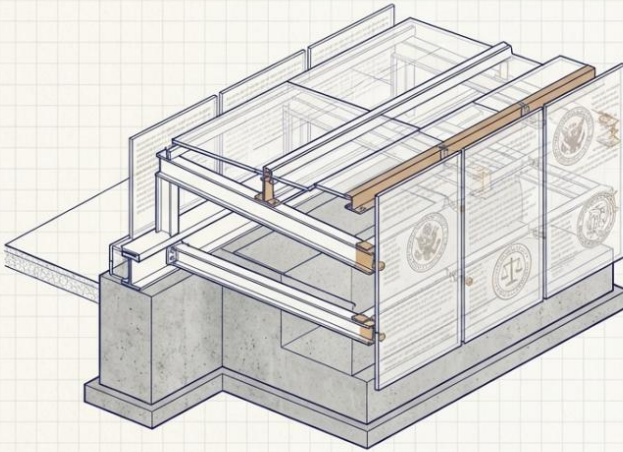
Featured Mathematics: RL Circuit Analysis

The voltage across an inductor leads the current by 90°. Competence requires the ability to visualize and apply vector math to AC problems.



$$V^2 = V_R^2 + V_L^2$$

LAYER 2: The Gauntlet of Regulatory and High-Reliability Compliance



Once power systems are put in the ground, the engineer operates under the law and is accountable to the highest standards of safety and reliability. Competence must be legally defensible and robust enough for mission-critical applications.

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A Career Path Transformed into a Vetted Security Profile

Security Compliance:

- **Regulator:** Private Security Industry Regulatory Authority (PSIRA), governed by Act 56 of 2001.
- **Mandatory Structure:** Formal PSIRA grade structure (E, C, B) dictates legally permissible roles.
- **The Critical Gate:** The mandatory PSIRA clearance certificate under Section 23(1) for ex-employees of military and police forces. This transforms past service into a compliance artifact requiring regulatory approval.



Occupational Health & Safety (OHS) Compliance:

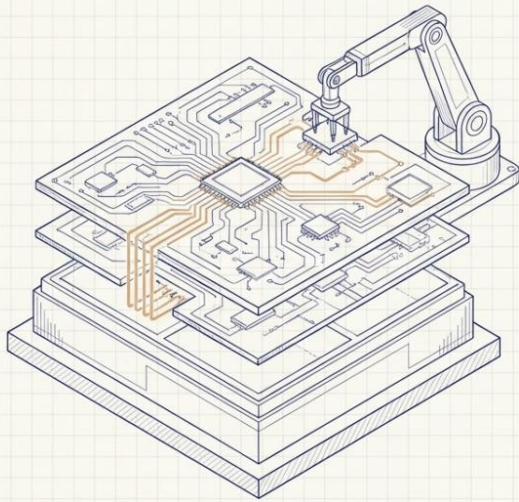
- **Foundation:** OHS Act of 1993.
- **Specific Standards:** SANS 10142 (Electrical Installation Safety) and SANS 60335-2-76 (Electric Fences).

Adherence to Mission-Critical Standards: Prohibited Materials per MIL-STD-11991B

In high-reliability systems, certain materials and processes are forbidden due to unacceptable risks to performance, reliability, and safety.

Item/Process	Prohibition Detail	Rationale (from MIL-STD-11991B)
Materials: Cadmium	Use of cadmium plating is prohibited.	Highly toxic and subject to sublimation (outgassing) under vacuum, which can cause short circuits.
Materials: PVC Plastics	Use of PVC plastics and electrical insulation is prohibited.	Subject to degradation from outgassing; is flammable and gives off toxic, corrosive fumes.
Parts: Selenium Rectifiers	Use of selenium rectifiers is prohibited.	These components have known degradation and reliability concerns. (C.2.2.4)
Processes: Improper Soldering	Solder iron rework of ceramic capacitors without a validated procedure is prohibited.	Ceramic parts are easily damaged by uncontrolled thermal shock, inducing microcracks and premature failure.

LAYER 3: The Digital Synthesis – Automating Complexity



The technical and regulatory requirements are too vast to manage manually. The only viable solution is to build a **self-validating digital system** that automates tracking, verifies compliance, and synthesizes all evidence into a single, auditable artifact.

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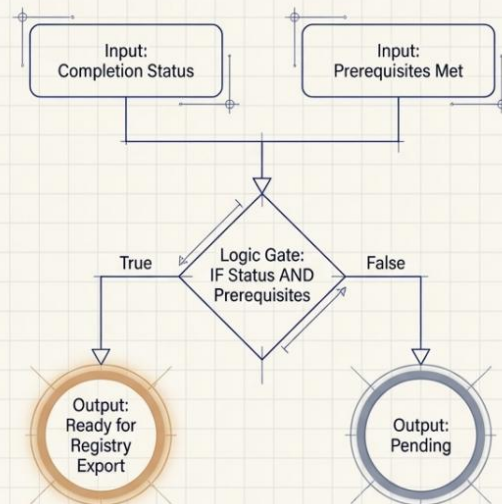
From Manual Checklist to a Self-Validating System

The Core Engine: A Learning Management System (LMS) governed by automated logic, built using tools like Visual Basic for Applications (VBA).

The Validation Logic: The system uses conditional logic to determine readiness for certification. A simplified version of the logic is shown:

```
IF (Status = "Completed") AND (ND_Prerequisites = "Met")  
THEN  
    Generate_Status = "Ready for Registry Export"  
ELSE  
    Generate_Status = "Pending"  
END IF
```

The Result: This creates a career artifact that is not just robust, but programmatically auditable. It minimizes the risk of human error during a compliance check or dispute referral.



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A Strategy of Targeted, Continuous Skill Building

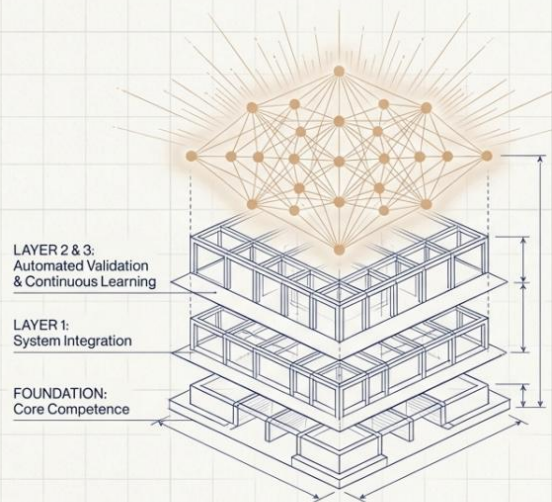
The digital framework tracks modular course completions from global providers, demonstrating a commitment to lifelong learning.



****Key Insight**:** These are not generic academic courses; they are highly specific industrial skills acquired to meet the demands of modern power and automation systems.

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LAYER 4: The Intellectual Edge and Forward Vision



A truly future-proof career framework does not stop at competence. It builds an intellectual edge by engaging with advanced tools, understanding their philosophical limits, and using this insight to architect the future of the field itself.

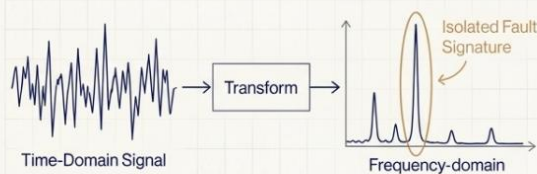
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From Reactive Fixing to Proactive Prediction and Philosophical Inquiry

Advanced Diagnostic Tools

The Mathematics: Fourier and Laplace transforms.

The Application: These transforms move a messy machine signal (like vibrations or current spikes) from the time domain to the frequency domain. This is essential for filtering noise and isolating the specific frequency signatures of a developing fault, enabling predictive maintenance.



The Philosophical Limit

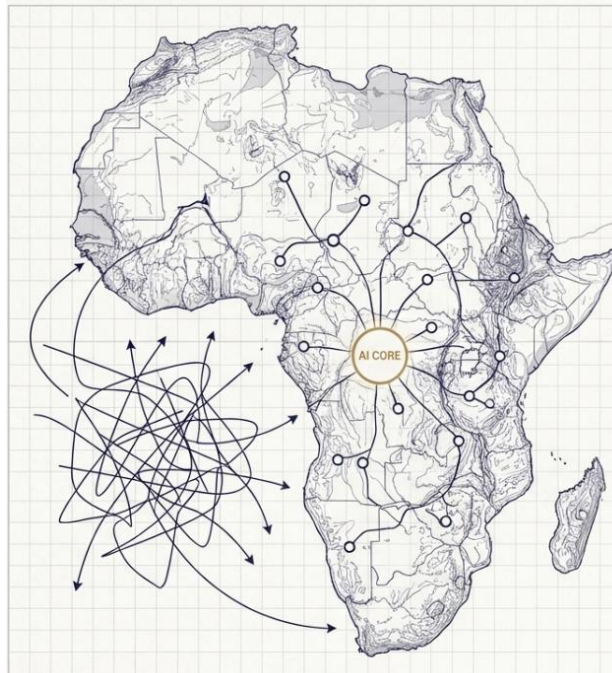
The Concept: John Searle's "Chinese Room Argument."

The Engineering Question: Does the diagnostic AI truly *understand* the transformer fault, or is it just running an incredibly advanced pattern-matching algorithm?

Why it matters: A high-level engineer must understand the limits of the tool to trust its output and diagnose novel failures.



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A Provocative Question for the Future of National Curriculum Design

The Catalyst: A postdoctoral funding proposal submitted to the National Research Foundation (NRF) for research in "Curriculum diagnostics and credentialing for engineering education in Africa."

The Logical Extension: The entire preceding presentation has demonstrated a system that can successfully map, automate, and audit the technical and regulatory mastery of one complex career.

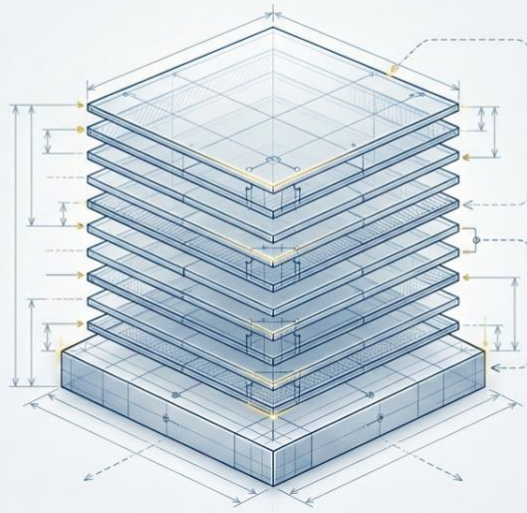
If this architecture works perfectly for one, how soon before entire national curriculum pathways are dictated, audited, and updated instantaneously by AI-driven logical systems—completely bypassing traditional regulatory committees?

The pressure to apply a working model at a national scale may be unstoppable.

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The Competency Stack: A Blueprint for the Modern Technical Professional

An integrated framework for building verified expertise, from foundational aptitude to Industry 4.0 mastery and professional accreditation.



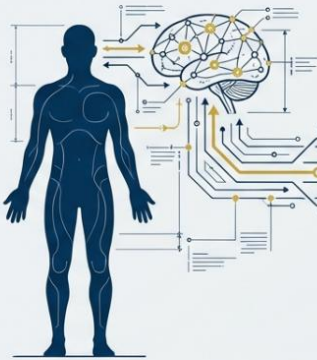
PROJECT NAME: Tshingombe Tshitadi

THE FOUNDATION: GROUNDING POTENTIAL IN DATA AND STRATEGIC PATHWAYS

The framework begins by mapping innate strengths to industry needs, ensuring a precise fit between the individual and their technical vocation.

PSYCHOMETRIC & APTITUDE PROFILING

Identifies aptitudes, learning barriers, and career inclinations (Ref 62.1). Utilizes tools for school readiness, neurodevelopmental assessments, and learning disorder diagnostics.



CAREER PERSONALITY MAPPING

Aligns personality types with technical roles:

- **Realistic:** Hands-on, mechanical, fixing (e.g., Mechanical Technician, Panel Builder).
- **Investigative:** Analytical, scientific, logical (e.g., Quality Tester).
- **Enterprising:** Leadership, sales, decision-making.

SECTORAL PATHWAY ANALYSIS

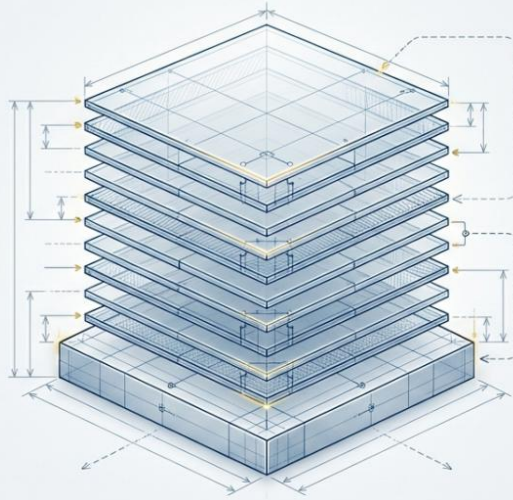
A comprehensive survey of career pathways across key Sector Education and Training Authorities (SETAs):

- **MERSETA:** Manufacturing, Engineering & Related Services.
- **MQA:** Mining Qualifications Authority.
- **CHIETA:** Chemical Industries.
- **ISETT SETA:** ICT & Software Engineering.

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The Competency Stack: A Blueprint for the Modern Technical Professional

An integrated framework for building verified expertise, from foundational aptitude to Industry 4.0 mastery and professional accreditation.



PROJECT NAME: Tshingombe Tshitadi

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LAYER 1: THE BEDROCK OF SAFETY AND PROFESSIONAL CONDUCT.

Mastery of operational safety is the non-negotiable first layer of competence, integrating internationally recognized standards into daily practice.



1. FIRE SAFETY & EXTINGUISHER OPERATION

Full command of the Fire Triangle and the P.A.S.S. Method (Pull, Aim, Squeeze, Sweep).

2. FIRST AID & EMERGENCY RESPONSE

Proficiency in the ABCs of First Aid and immediate treatment protocols for electric shock.

3. WORKPLACE ORGANIZATION (5S SYSTEM)

Implementation of the 5S methodology to ensure an efficient and hazard-free environment.

4. REGULATORY ADHERENCE

Application of guidelines from the National Electrical Code (NEC) 2011 and understanding of BIS/ISO certification benefits.

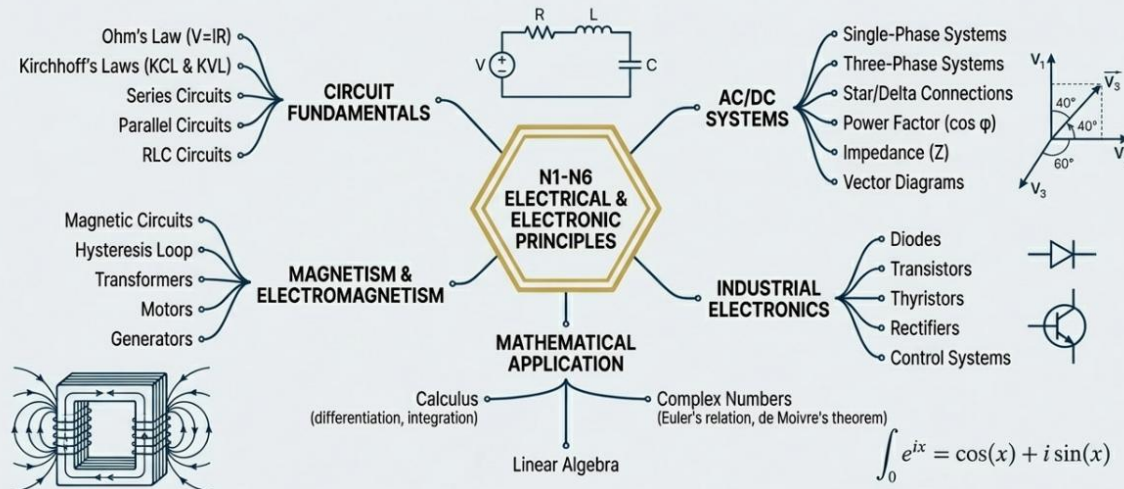
5. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Correct selection and use of PPE as the final line of defense against workplace hazards.

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LAYER 2: CORE CRAFT—MASTERING ELECTRICAL AND ELECTRONIC THEORY.

A deep, systematic understanding of the physical laws governing electrical systems, forming the theoretical core of the N1-N6 curriculum.

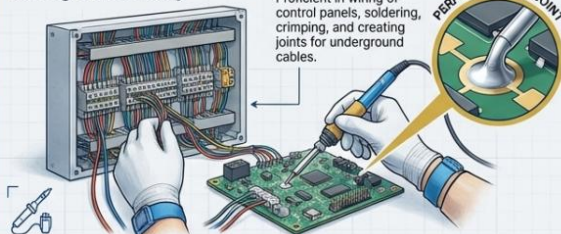


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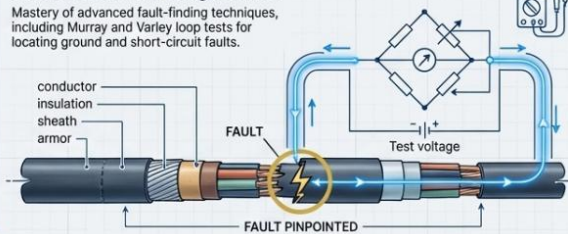
LAYER 3: APPLIED SKILL—FROM SCHEMATICS TO SOLDERED CIRCUITS.

Bridging theory and practice through extensive hands-on workshop experience, focusing on precision, diagnostics, and real-world problem-solving.

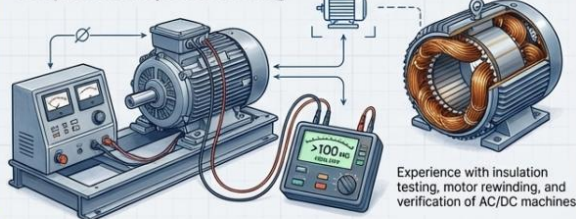
Wiring & Assembly



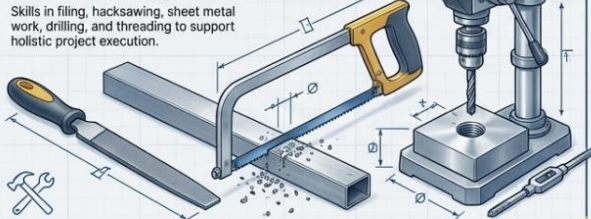
Fault Location & Diagnostics



Component & System Testing



Allied Trades Practice



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LAYER 4: THE DIDACTIC FRAMEWORK—ADVANCED PEDAGOGY AND LEARNING SYSTEMS.

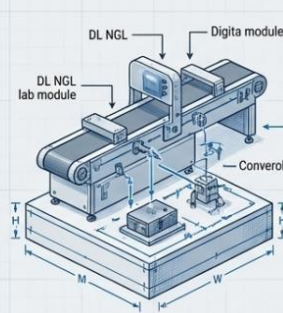
A curriculum delivered through a modern pedagogical lens, integrating Work-Based Learning (WBL) with state-of-the-art didactic laboratory systems for an immersive educational experience.

Learning Models

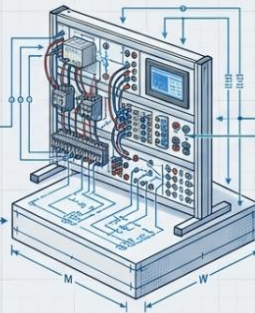


- Experiential Learning ("Learning by Doing")
- Apprenticeship Models
- Competency-Based Learning frameworks

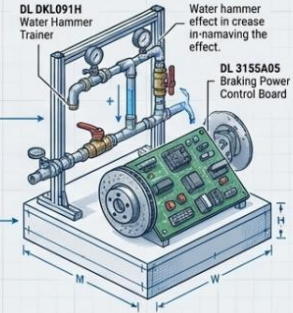
Industry-Leading Training Systems



De Lorenzo (DL) Modular System
Next Generation Lab Modules (DL NGL) for Big Data, IoT, and Conveyor Belt simulations (CIMSIM).



Lucas-Nülle InsTrain Panel
Project-based learning for wiring installation and safety systems testing as per DIN VDE standards.



Specialized Trainers
Computerized trainers for specialized fields like hydraulic systems (DL DKL091H) and automotive braking (DL 3155A05) for ABS/ASR/ESP.

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LAYER 5: THE AUTOMATION LAYER—COMMAND OF PLC, SCADA, AND ROBOTICS.

Expertise in the core technologies of industrial automation, moving beyond basic electrical skills to the design and management of complex, automated systems.

Control Logic

Reading PLC wiring diagrams, understanding digital/analog I/O, and programming for industrial control.



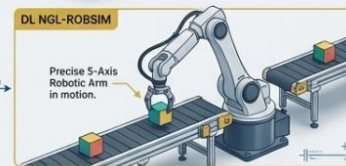
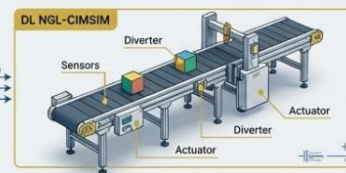
Reading PLC wiring diagrams, understanding digital/analog I/O, and programming for industrial control.

Supervision & Monitoring



System monitoring and control using SCADA platforms, including remote access.

Simulated Industrial Environments

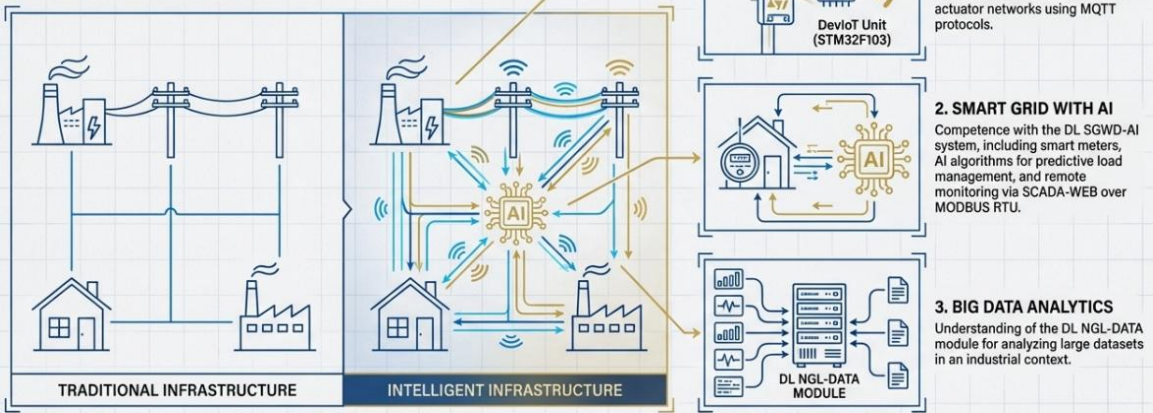


8/2021/10/2021

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LAYER 6: THE SMART SYSTEMS LAYER—DEPLOYING IoT, SMART GRIDS, AND BIG DATA.

Designing and implementing intelligent infrastructure by integrating IoT devices, data analytics, and AI-driven control into traditional electrical networks.



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LAYER 7: THE INTELLIGENCE LAYER—ACHIEVING AI AND MACHINE LEARNING FLUENCY.

A disciplined approach to artificial intelligence, grounded in the Sci-Bono ICT Academy's AI Fluency Program, moving beyond application to a core understanding of AI principles.

FORMAL TRAINING



Sci-Bono
ICT ACADEMY

Completion of the AI Fluency Program

- 44 videos, 6 Microsoft-recognized certifications

PHILOSOPHICAL UNDERPINNINGS

A. THE TURING TEST



Can a machine's responses be indistinguishable from a human's?

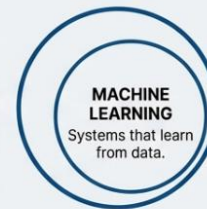
B. THE CHINESE ROOM ARGUMENT



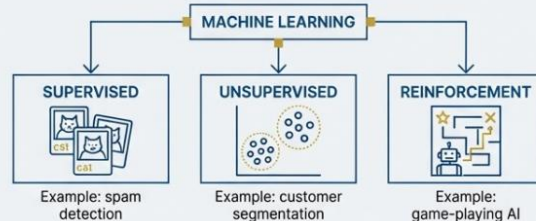
Simulating knowledge vs. true understanding.

CORE DISTINCTIONS

ARTIFICIAL INTELLIGENCE
Simulating human intelligence.



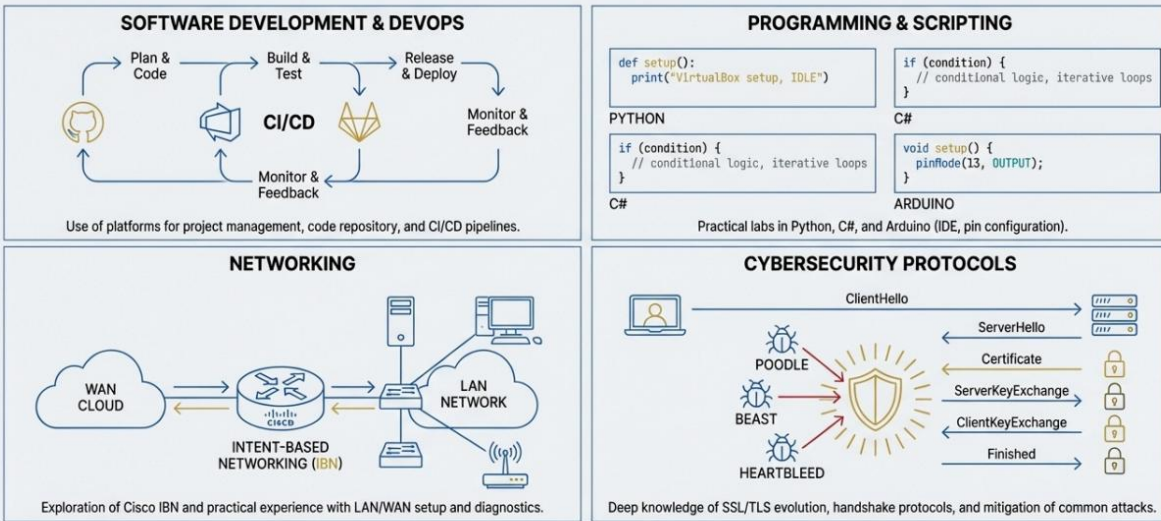
TYPES OF MACHINE LEARNING



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LAYER 8: THE DIGITAL INFRASTRUCTURE LAYER—MASTERING NETWORKS, SOFTWARE, AND SECURITY.

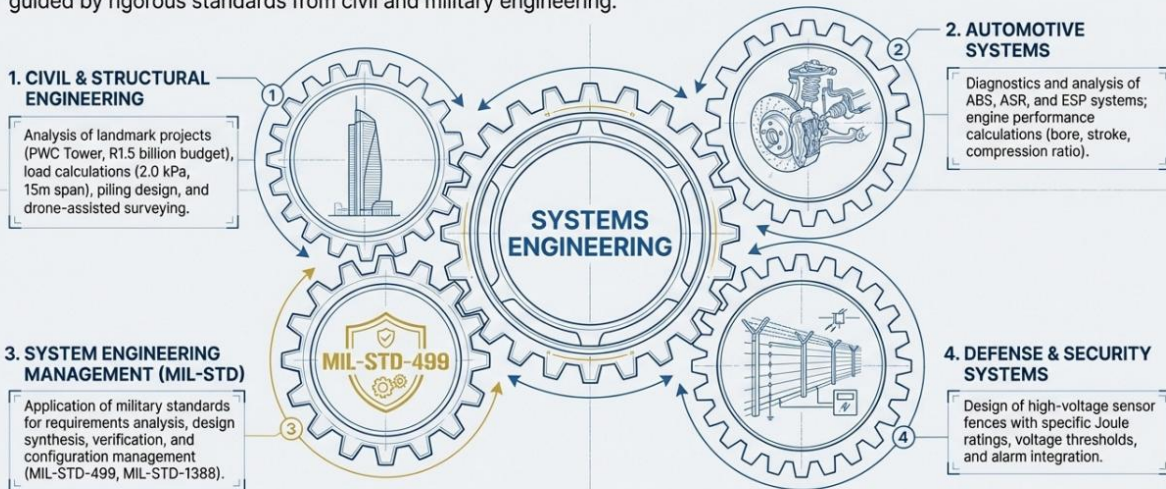
Competence in building, managing, and securing the digital platforms that underpin modern technical systems, from code repositories to secure network protocols.



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LAYER 9: THE SYSTEMS ENGINEERING LAYER—INTEGRATING CROSS-DISCIPLINARY KNOWLEDGE

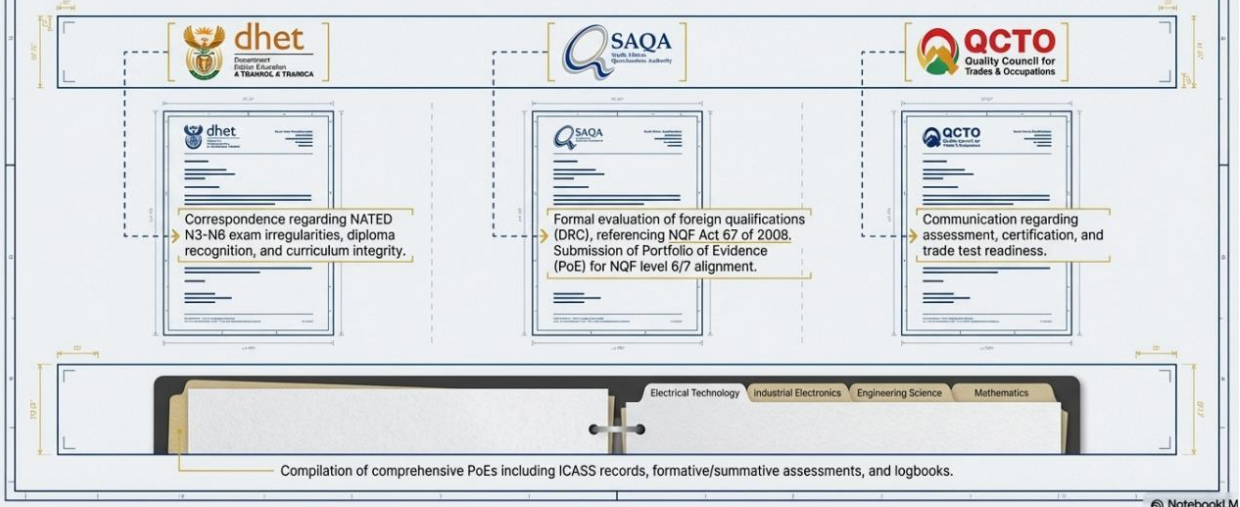
Applying a holistic systems engineering approach by integrating principles from diverse technical fields, guided by rigorous standards from civil and military engineering.



NotebookLM

LAYER 10: THE ACCREDITATION FRAMEWORK—ENGAGING WITH NATIONAL QUALIFICATION AUTHORITIES

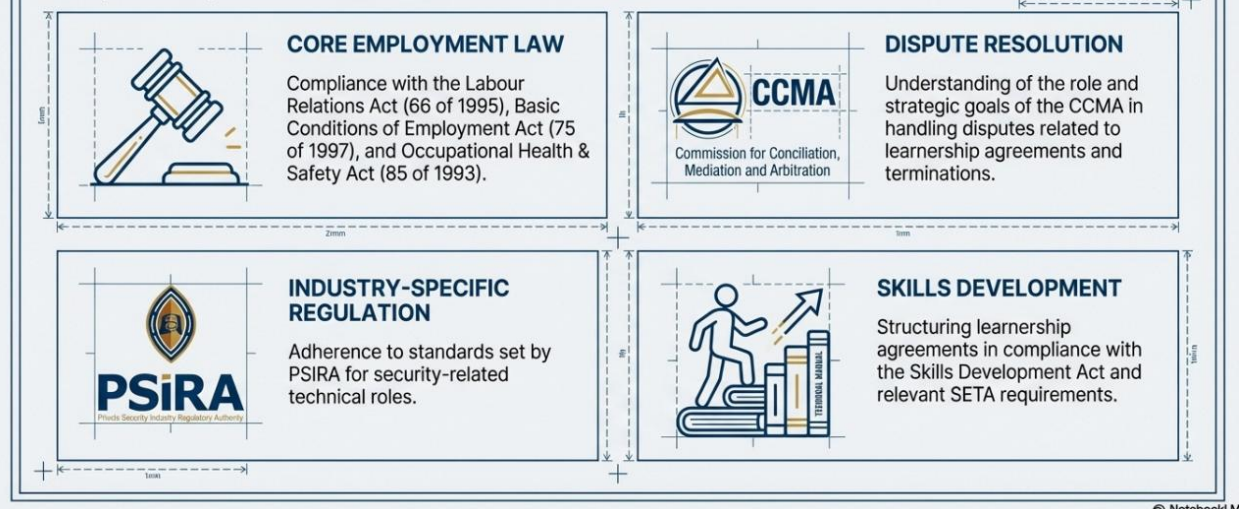
Proactive and documented engagement with South Africa's primary qualification and education authorities to ensure compliance, verify qualifications, and resolve administrative complexities.



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LAYER 11: THE LEGAL & LABOUR FRAMEWORK—ADHERENCE TO STATUTORY AND INDUSTRY LAW

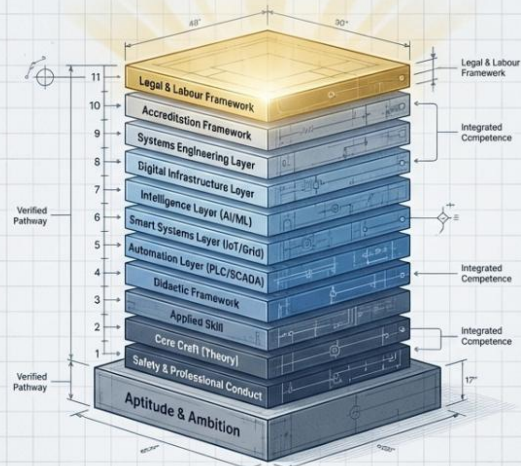
A robust understanding of the legal obligations and frameworks governing skills development, employment, and workplace safety in the South African context.



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The Complete Competency Stack: A Synthesis of Verified Expertise.

This integrated framework represents a complete pathway from identified potential to a fully realized technical professional, proficient in foundational craft, fluent in Industry 4.0 technologies, and compliant with national qualification and legal standards. It is a definitive statement of competence.



A professional built by design, not by chance.

The Blueprint for an Auditable Engineerile Engineering Career

To illustrate the key components required to build a modern, verifiable, and high-integrity career in engineering, integrating technical qualifications, regulatory compliance, and digital management.

THE TECHNICAL & REGULATORY FOUNDATION

The Cornerstone Qualification:
National N Diploma



Non-Negotiable Safety Compliance



Security Vetting is a Career Gateway



The Cornerstone National N Diploma
Achieved by combining N4-N6 theory with 24 months of verified workplace experience.

Non-Negotiable Safety Compliance
Mastery of standards like SANS 10142 for electrical installations is mandatory.

Security Vetting is a Career Gateway
PSIRA regulations require formal clearance, linking engineering roles to national security.

THE DIGITAL & INTELLECTUAL EDGE

The Digital Portfolio of Evidence (PoE)



Adopting a High-Reliability Mindset



Future-Proofing with AI & Advanced Math



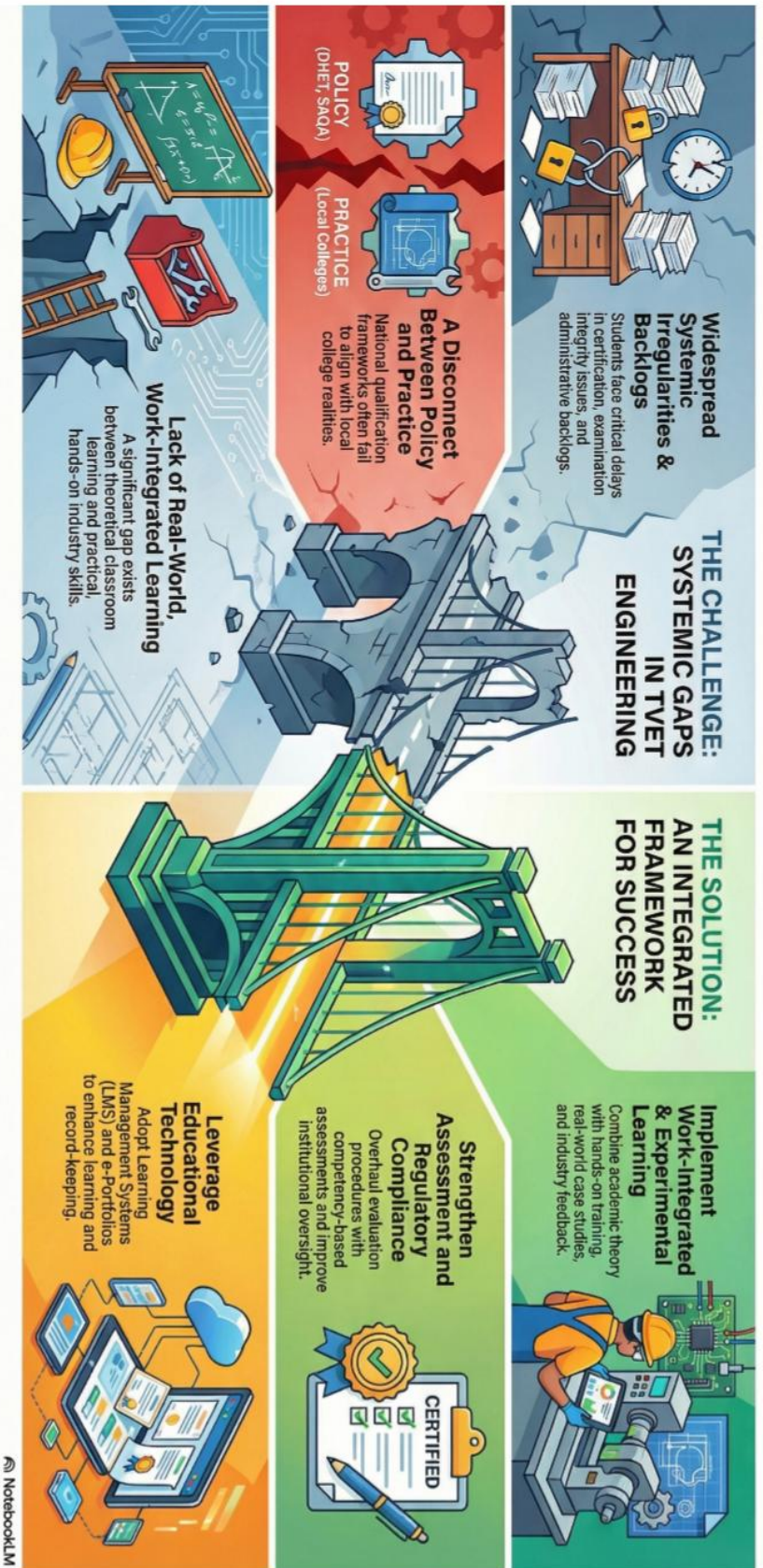
Use automation (VBA, LMS) to create a single, auditable, and self-validating career artifact.

Military standards (MIL-STD-11991B) inform best practices by forbidding failure-prone components.

Move from reactive fixing to proactive prediction using AI and Laplace/Fourier transforms.

Prohibited Item & Rationale (from MIL-STD-11981B)	
PVC Plastics & Insulation	Degrades by out-gassing, is flammable, and releases toxic fumes when burning.
Specific Locking Devices	Sheet spring nuts and fiber inserts pose vibration and shape retention risks.
Circuit Protection Fuses	Unpredictable failure characteristics and require extensive maintenance for replacement.

Bridging the Gap: Reforming Vocational Education in South Africa



The Modern Engineer's Blueprint:

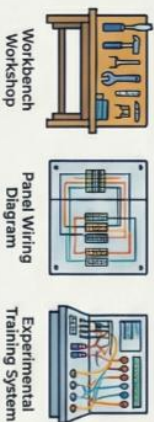
A Journey Through Trades, Technology, and Systems

FOUNDATIONAL SKILLS: ENGINEERING & SKILLED TRADES

Mastery of Core Electrical Principles



Competence in Hands-On Trades & Didactics



Aligned with National Qualification Frameworks

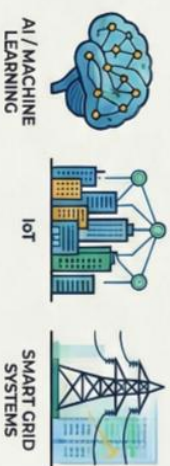


ADVANCED INTEGRATION: ICT & MODERN SYSTEMS

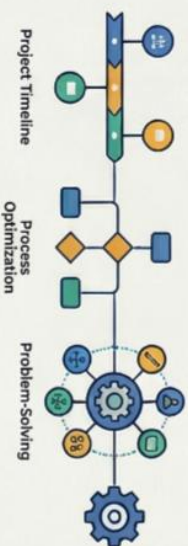
Proficiency in ICT & Software Development



Expertise in Emerging Technologies



Focus on Systems Engineering & Management

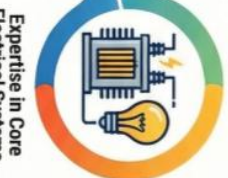


Building a Career in Engineering: A Multifaceted Journey

Building the Foundation



Advanced Mathematical and Scientific Proficiency.
Applied advanced calculus and engineering science to solve complex, real-world problems.



Expertise in Core Electrical Systems and Technologies.
Includes AC/DC machines, PLCs, transformers, and circuit theory.



DHET: Department of Higher Education & Training
SAQA: South African Qualifications Authority
QCTO: Quality Council for Trades & Occupations

Professional Application & Growth



Diversified Skills Through Continuous Online Learning
Earned multiple certificates and diplomas from platforms like Alison and Microsoft.

Authored Ambitious Research in Modern Engineering.
Developed thesis proposals on rural energy, smart grids, AI, and IoT systems.



Actively Pursued High-Level Technical and Specialist Roles.
Applied to leading organizations like SARS, Eaton, and Schneider Electric.

Navigating Your Career Path in South Africa: From Education to Employment



1. Build Your Educational Foundation

Understand NATED Qualifications



Progress through N1-N6 levels to progress through N1-N6 levels to build technical, theoretical, and practical skills for your chosen vocation.

Get Your Qualifications Verified by SAQA



The South African Qualifications Authority (SAQA) evaluates qualifications to ensure they meet national standards.



2. Gain Practical Experience

Integrate Workplace-Based Learning



Combine academic studies with practical, on-the-job training like internships or apprenticeships to enhance employability.

Master Essential Technical Skills



Focus on core competencies like electrical wiring, circuit design, soldering, and using diagnostic tools.

Build a Portfolio of Evidence (PoE)



Document all your projects, assignments, and work experience to showcase your skills to employers and accreditation bodies.



3. Know Your Rights

Your Personal Information is Protected (POPIA)



Employers must protect your personal data and cannot process it without your consent or legal obligation.

Address Workplace Disputes



Use institutions like the CCMA (Commission for Conciliation, Mediation and Arbitration) to resolve labor-related issues.



How to Obtain a Protection Order

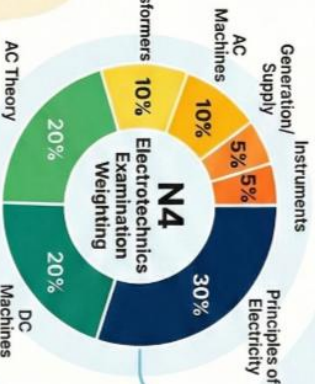


If you face domestic violence or harassment, you can apply for a court-issued protection order for your safety.

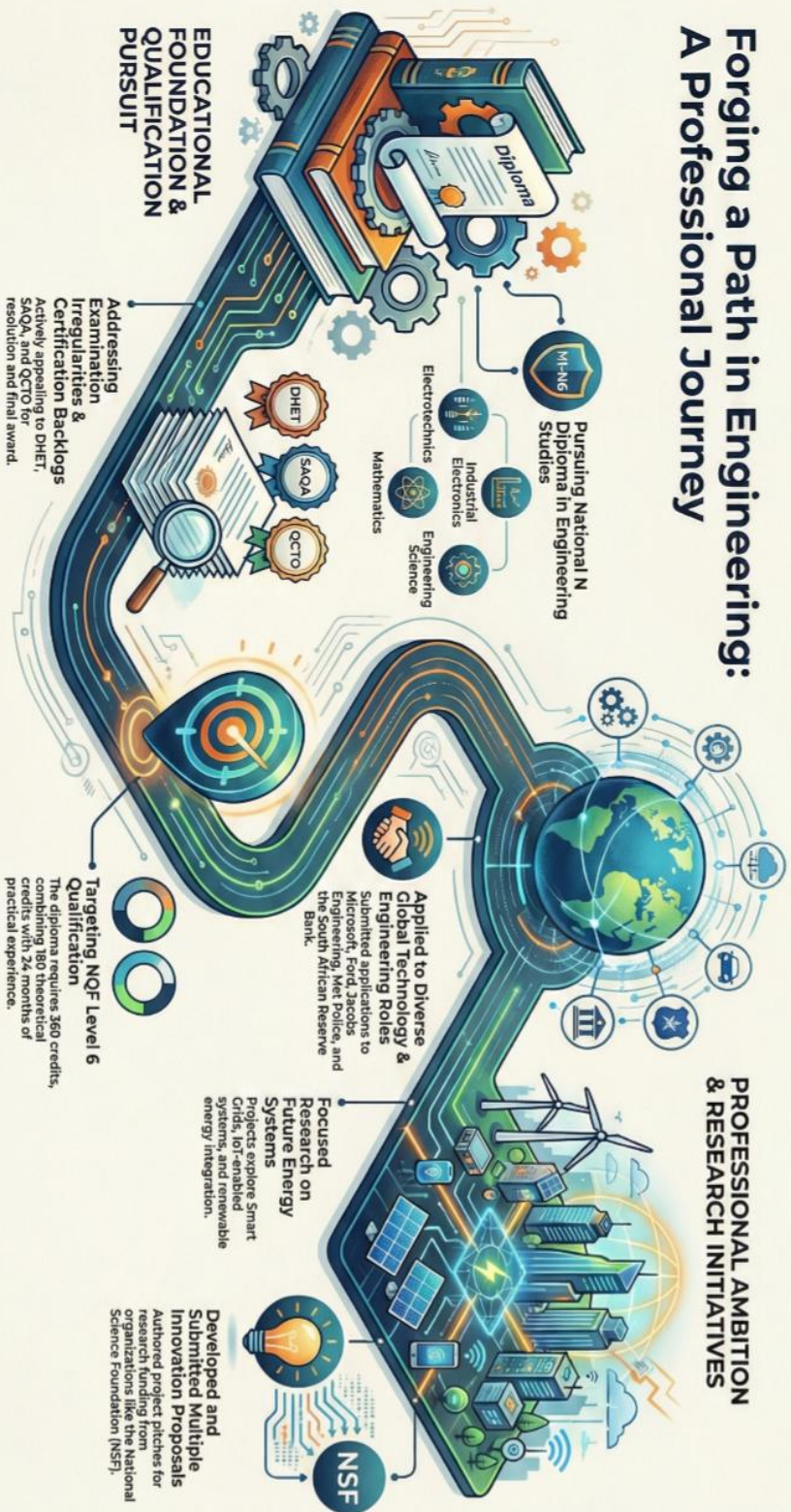
Lifelong Learning is Key



Continuously upgrade your skills with certifications in areas like Industrial Automation, IT, and Renewable Energy.



Forging a Path in Engineering: A Professional Journey



FORGING THE MODERN ARTISAN

An Integrated Framework for Developing Systems-Thinking Technologists

Traditional vocational training often creates specialists in isolated tasks. The modern industry, however, demands artisans who are dynamic problem-solvers—individuals who can navigate the entire lifecycle of a system, from theoretical design to practical implementation and rigorous validation.

This presentation outlines a holistic educational model:

The Integrated Technical Mastery Framework.

It is a deliberate system designed to fuse deep scientific principles with exacting practical application and learner-centric career development.

The goal is not just to train technicians, but to forge modern artisans who are resilient, adaptable, and indispensable.

NotebookLM

The Integrated Technical Mastery Framework



Pillar I: Foundational Science & Engineering

The Core Knowledge. Mastering the fundamental scientific principles and advanced mathematical models that govern modern electrical and electronic systems.



Pillar II: Applied Systems & Process Rigor

The Practical Validation. Translating theory into tangible outcomes through hands-on fabrication, testing, and adherence to mission-critical quality standards.



Pillar III: Pedagogical Innovation & Career Integration

The Human Application. A structured journey guiding the learner from career discovery and psychometric assessment to professional readiness and portfolio development.

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Pillar I: Foundational Science & Engineering

A Curriculum Built on Comprehensive NATED Standards

The framework is rooted in the nationally recognized NATED (National Accredited Technical Education Diploma) syllabi, ensuring a robust theoretical foundation. This covers a spectrum from foundational principles to advanced applications.

Electrotechnics (N4-N6)	Industrial Electronics (N3-N6)	Mathematics (N4-N6)	Foundational Sciences
- DC/AC Machines - Transformers - Power Generation & Supply	- Power Supplies - Amplifiers - Integrated Circuits - Oscillators - Phase Control	- Determinants - Complex Numbers - Trigonometry - Differential & Integral Calculus	- Engineering Science (N4): Kinematics, Dynamics, Statics, Hydraulics - Digital Electronics: Binary Logic, Boolean Algebra, Logic Gates



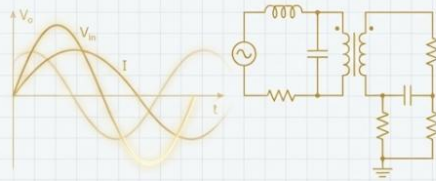
Key Takeaway Text: This is not just a list of subjects; it's a **curated knowledge base** designed to build a **deep, intuitive understanding** of electrical and electronic systems from first principles.

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Pillar I: Foundational Science & Engineering

Where Advanced Mathematics Meets Practical Engineering

We don't just teach theory; we apply advanced mathematical tools directly to engineering problems. This integration ensures graduates can model, analyze, and optimize complex systems, not just follow diagrams.



AC Circuit Analysis



NATED Module:
Electrotechnics N5 - Alternating Current Theory

Application:
To accurately determine the true power and efficiency of complex AC systems, we move beyond simple multiplication. We use integral calculus to calculate RMS values and analyze power loss in transmission.

Calculating RMS via Integration **Power Loss in Transmission (Integrals and Derivatives)**

$$V_{rms} = \sqrt{\frac{1}{T} \int_0^T v(t)^2 dt} \quad P_{avg} = \frac{1}{T} \int_0^T p(t) dt \quad \frac{dP_{loss}}{dt} = \dots$$

Electromagnetic Systems



NATED Module:
Electrotechnics N4 - Electromagnetic Induction

Application:
Understanding how transformers and generators work requires analyzing rates of change. We use derivatives to apply Faraday's Law, modeling how changing magnetic flux induces voltage.

Faraday's Law with Derivatives: $E = -\frac{d\Phi}{dt}$

$$E = -N \frac{d\Phi}{dt}$$



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Pillar II: Applied Systems & Process Rigor

From the Lab Bench to Mission-Critical Application

Theoretical knowledge is incomplete without rigorous practical validation. This pillar bridges the gap by transforming abstract concepts into tangible, reliable systems. Every practical task, from basic component testing to full system assembly, is framed by the discipline of industrial and military-grade standards.

Hands-On Lab Tasks

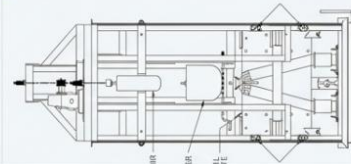
- ✓ Transistor as Electronic Switch
- ✓ Series Voltage Regulator Construction
- ✓ PCB Fabrication & Etching
- ✓ Power Control Circuit Assembly (TRIAC/SCR/IGBT)



Validated By

High-Stakes Standards

- ✓ **MIL-STD-11991B:** Parts, Materials, and Processes (PM&P) Management
- ✓ **MIL-STD-202:** Test Methods for Electronic and Electrical Component Parts
- ✓ Psychometrical/Statistical Tracking: Mean & Variance for Reliability
- ✓ Audit-Ready Documentation



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Pillar II: Applied Systems & Process Rigor

Implementing Military-Grade Lifecycle & Quality Management

Adherence to standards is demonstrated through the implementation of key requirements from MIL-STD-11991B. This ensures every component and process is managed for maximum reliability and traceability.

Clause	Requirement	Framework Application
4.4.1	Procurement	Ensure procurement meets system requirements via controlled supplier approval.
4.4.2	Counterfeit Prevention	Implement protocols to avoid counterfeit parts and control their impact.
4.4.5	Change Monitoring	Detect, track, and assess the impact of supplier changes on system performance.
4.4.7	Design/Use Data	Collect, store, and analyze all relevant PM&P data; enforce traceability.
4.4.11	Supply Chain Risk	Assess and mitigate supply chain risks (threats, vulnerabilities, disruptions).

This is not just about building circuits; it's about building certifiable, defense-grade systems.

NotebookLM

Pillar II: Applied Systems & Process Rigor

Creating Audit-Ready, Data-Driven Documentation Systems

We go beyond manual logbooks. Using Visual Basic, we build custom modules to automate testing, logging, and statistical analysis. This creates an unimpeachable, audit-ready record of every practical task, ensuring consistency and quality control.

Module: IntegratedAuditFramework

(General)

' Purpose: Unified logging and analysis for electrical tests
Type RelayTest
 TestID As String
 TapCurrent As Double
 FaultCurrent As Double
 TripTimeActual As Double
 ErrorPercent As Double
End Type

Public Sub LogRelayTest(ByRef r As RelayTest)
 r.FaultCurrent = r.TapCurrent * r.Multiplier
 ' ... error calculation ...
End Sub

Automated Test Log & Analysis

	A	B	C	D	E	F
1	Transistor Label	Test Results (A)	Status	Mean	Variance	Error %
2	TR-001	10.02	Pass	10.00	0.0004	0.20%
2	TR-002	9.98	Pass	10.00	0.0004	0.20%
3	TR-003	10.05	Fail	10.00	0.0004	0.50%

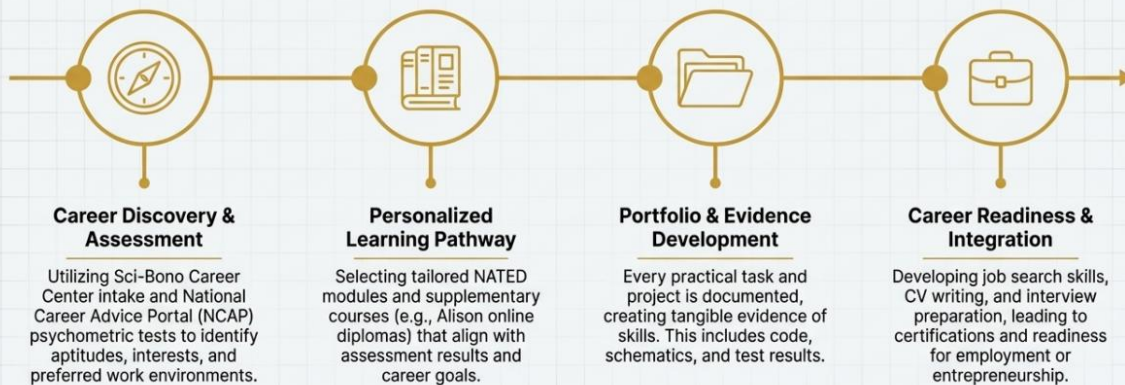
- Automates data capture during lab sessions.
- Enforces pass/fail gates based on set tolerances.
- Calculates statistical reliability (mean, variance).
- Generates an auditable, time-stamped record of work.

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Pillar III: Pedagogical Innovation & Career Integration

Mapping the Learner Journey: From Discovery to Deployment

Technical skills must be paired with career strategy. This pillar guides learners through a structured pathway that begins with self-assessment, moves through targeted learning, and culminates in a professional portfolio that demonstrates readiness for the job market.



Pillar III: Pedagogical Innovation & Career Integration

Data-Driven Guidance: Aligning Aptitude with Opportunity

The learner's journey starts with objective data. By using the National Career Advice Portal (NCAP), we identify a learner's innate abilities and align them with career fields where they are most likely to succeed.

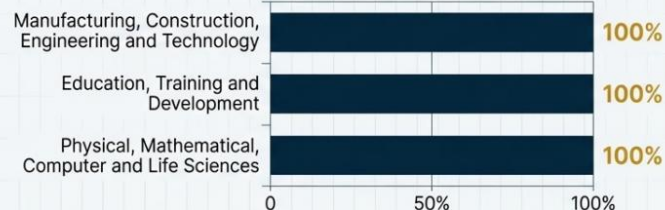
The Assessment

A psychometric tool that assesses a learner's talents, skills, and abilities.

Sample question areas:

- ✓ Problem-solving skills
- ✓ Hands-on competency
- ✓ Logical and methodical approach
- ✓ Creative and practical solutions

The Results



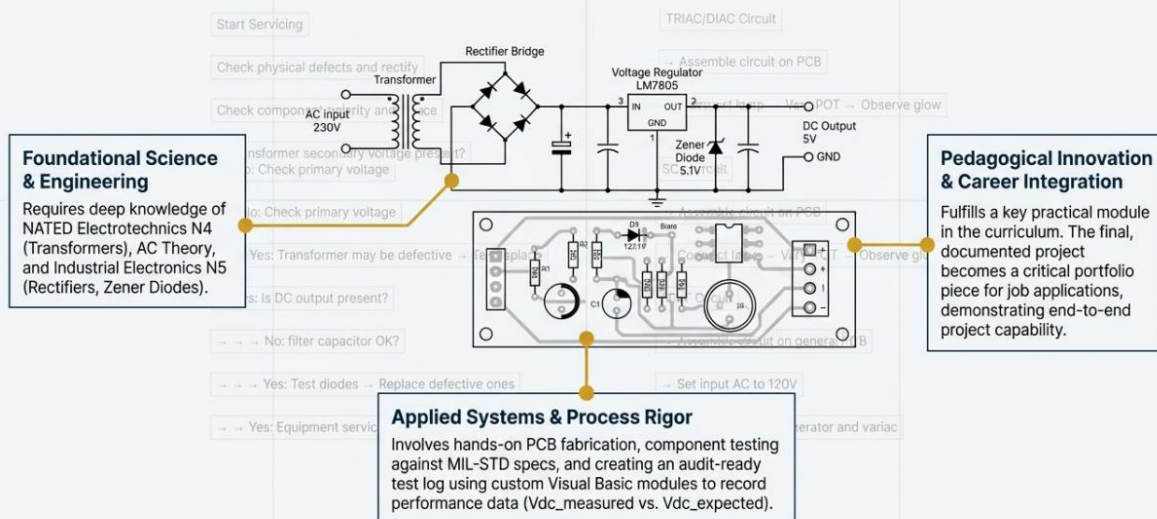
→ The results provide a clear, evidence-based mandate to guide the learner towards an engineering and technology pathway.



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The Synthesis: Integrating All Pillars in a Capstone Project

Case Study: Designing and Auditing a Regulated Power Supply



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Scaling the Framework to Complex Industrial Systems

The principles of integrated mastery are not limited to the lab. The framework is designed to prepare artisans for the complexity of modern industrial and utility-scale systems. The same methodology of combining deep theory with rigorous, documented practice applies to:



Thermal Power Plants

Analyzing steam generation, turbines, and alternators with a focus on efficiency and safety protocols.



Hydro-Electric Power Plants

Understanding turbine mechanics, schematics, and transformer specifications for high-voltage transmission.



Renewable Energy Systems

Solar Power: Designing array strings, combiner boxes, and grid interconnects. Logging performance data via SCADA.
Wind Power: Analyzing rotor aerodynamics, gearbox mechanics, and yaw control systems.



Transmission & Distribution Substations

Testing circuit breakers, relays, and CT/PT systems using current injection units and documenting trip times.

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The Outcome: A New Generation of Systems-Thinking Artisans

The Integrated Technical Mastery Framework produces more than just qualified technicians. It cultivates professionals who are:

- **Analytically Rigorous:** They understand the 'why' behind the 'how', using first principles and advanced mathematics to solve novel problems.
- **Practically Grounded:** Their skills are validated against the highest industry and military standards, ensuring reliability and quality.
- **Strategically Minded:** They see the entire system, from component lifecycle to career integration, making them valuable assets in any technical organization.

This portfolio serves as the definitive evidence of this framework's validity and its capacity to build the engineering talent required for the challenges of tomorrow.



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Appendix: Digital Competencies and Research Portfolio

Microsoft & Azure Cloud Ecosystem	Research Interests & Submissions
 Azure AI & Machine Learning: Azure AI Search, PyTorch, Classification & Regression Models.  DevOps & Git: Agile Methodologies, CI/CD with GitHub Actions.  Software Development: C#, Python, Jupyter Notebooks.  Data & Fabric: Microsoft Fabric Administration, Power BI Deployment.  Azure Architecture: Well-Architected Framework, Cost Optimization, Network Solutions.	 Topics: Education Technology, Rural Energy Integration, Smart Grids, AI-Based Predictive Maintenance.  Engagements: Submissions and applications to platforms such as NSF, NRF, and the International Journal of Engineering and Technology Research (IJETR).  Digital Presence: Active portfolio on platforms like Internet Archive and GitHub.
	  

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Bridging the Gap: A New Framework for Vocational Engineering Excellence in South Africa

A Case Study and Proposal for Integrating NATED & NCV Programs



Tshingombe Tshitadi Fiston



The Case of Tshingombe Tshitadi: A Dossier of Persistent Ambition and Systemic Friction

An evidence-based account of one individual's multi-year effort to achieve engineering qualification and professional employment in South Africa.

CASE FILE DETAILS

Subject: Tshingombe Tshitadi Fiston

ID: TIRCOG000910610

Field: Electrical Engineering (NATED Studies)

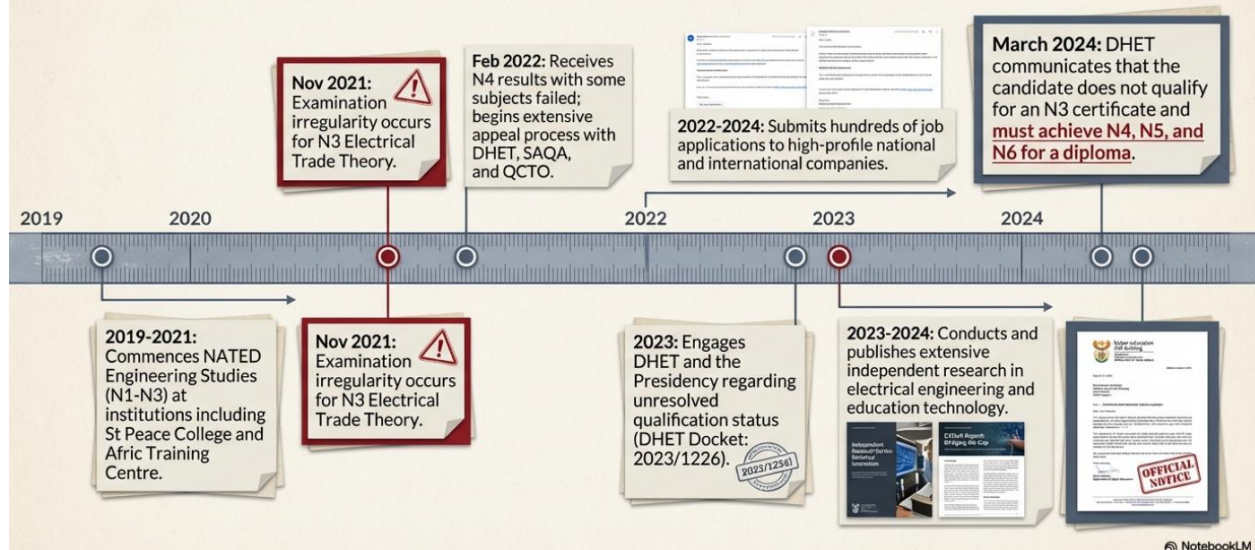
Period Under Review: 2019 - 2024

Status: Unresolved

UNRESOLVED

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A Timeline of Unwavering Effort



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The Educational Foundation and the Point of Fracture

NATED Pathway Undertaken (N1-N6)

Institutions: St Peace College, Shalom Technical College, Afric Training Centre.

Key Subjects: Industrial Electronics, Electrical Trade Theory, Mathematics, Engineering Science, Electrotechnics (Levels N1-N4 cited).

The Critical Incident: Examination Irregularity

EXHIBIT A

"My motivation and disciplinary assessment submitted my portfolio... release result statement and finalized award diplomat by examination committed irregularity November invalide subject n3 trade theory electrical... the result of assessment was not release reason irregularity n3."

Official status from DHET records:

Subject Code	Subject	Level	Reason
N3	ELECTRICAL TRADE THEORY	N3	UNDER INVESTIGATION

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Navigating a Labyrinth of Appeals



Key Action: Formal appeal regarding N3 irregularity and non-issuance of certificates. (Docket Number: 2023/1226)



Key Action: Submitted foreign qualification from DRC for evaluation (Ref: 201911130002) and sought guidance on N-Diploma pathway.



Key Action: Enquiries regarding certification and assessment.

DHET Response (March 2024):
"Candidate does not qualify for an N3 certificate as he did not pass all subjects. For a candidate to be awarded with a diploma... they must achieve N4, N5 and N6 certificates plus relevant work experience."

SAQA Response:
"SAQA accepted only qualifications official examination body country... external examination based."

Indicates non-compliance issues with submitted documents.

QCTO Response:
"Please note that the QCTO does not issue any of results."

*Directs candidate back to DHET

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An Unrelenting Pursuit of a Professional Career

While awaiting resolution on his qualifications, Mr. Tshingombe has submitted hundreds of applications for technical and engineering roles. This demonstrates a consistent and determined effort to enter the professional workforce.

Selected Job Titles Applied For:

- Software Engineer II (Microsoft)
- Data Center Technician (Microsoft)
- Cloud Engineer (SARB)
- Infrastructure Engineer (Met Police)
- Manufacturing Engineer (Ford)
- Specialist: Case Selection (SARS)

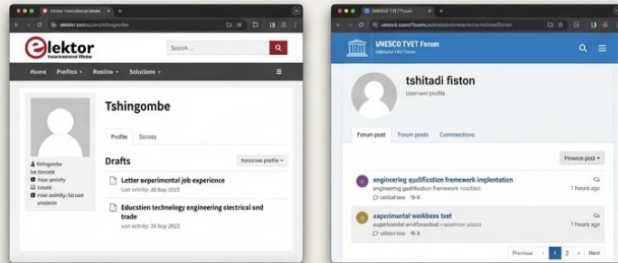
Exhibit B: The Digital Paper Trail of Applications

Thank you for your Application! Microsoft Recruiting to me Microsoft Hi [Candidate Name], Thank you for applying for the Software Engineer II (Job number: 1755381) position. We have received your application and are reviewing it. Regards, Microsoft Recruiting Team	Your recent job application for (649) Cloud Engineer - BSTD - 649 SARB Talent Acquisition to me SOUTH AFRICAN RESERVE BANK Dear Applicant, We have received your application for the Cloud Engineer position. Your profile is being processed. Best, SARB Talent Acquisition.
Vacancy: 17877 - Infrastructure Engineer Met Recruitment Team to me METROPOLITAN POLICE Thank you for your application for the Infrastructure Engineer vacancy. We will contact you shortly with an update. Kind regards, Met Recruitment.	Application Outcome: Specialist: Case Selection (Transfer Pricing) SARS Human Capital to me SARS South African Revenue Service Dear Applicant, After careful consideration we regret to inform you that your application was not successful for the Specialist: Case Selection (Transfer Pricing) position. Thank you for your interest. Sincerely, SARS Human Capital

Beyond the Curriculum: A Profile of a Self-Directed Engineer

Mr. Tshingombe's activities extend far beyond coursework and job applications. He is an active participant in technical communities, a consumer of specialized knowledge, and a creator of his own technical projects.

Community Engagement & Publications



- **Internet Archive:** Uploaded documents including "portfolio document st pace tshingombe" and "ccma labour court tshingombe job."

Professional Development



SABS: Records of online enquiries and orders related to "Trade engineering electrical research."



IEC (International Electrotechnical Commission): Quotation request for "IEC 62368-1:2023 Academy Masterclass."



Policing Project (NYU Law): Registration Registration for "Removing Barriers to Officer Accountability" webinar, demonstrating interest in systemic processes.

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A Glimpse into the Engineer's Notebook

The subject's personal notes reveal a deep exploration of advanced engineering concepts, from fundamental circuit theory to complex power systems and control logic.

Exhibit C: Theoretical Foundations

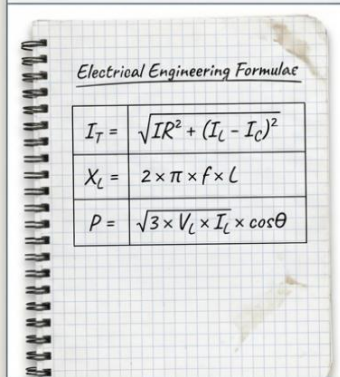


Exhibit D: Systems & Control Theory

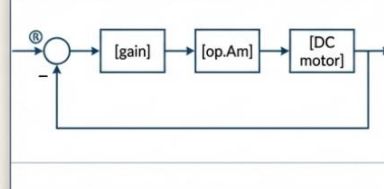


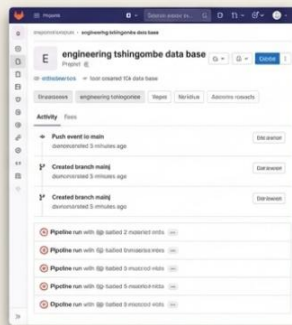
Exhibit E: Research Topics

- Smart Grid Power Systems & Cybersecurity
- Nanotechnology & Semiconductor Materials
- Power Harmonic Filter Analysis
- IoT-Enabled Electrical Systems
- Transformer Rewinding & Generator Stator Repair
- Machine Learning Models for Power Systems (Linear Regression)

Proving Ground: Modern Development & DevOps Practices

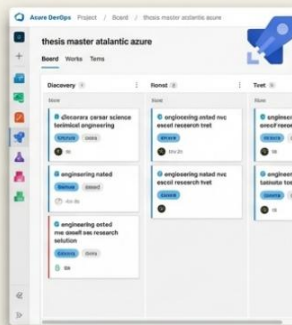
Mr. Tshingombe actively uses industry-standard platforms to manage his technical projects, demonstrating proficiency in version control, CI/CD pipelines, and cloud infrastructure.

Section 1: GitLab – Source Code & Project Management



- Repository activity log shows push events and merge requests.
- Evidence of CI/CD pipeline implementation (list of failed pipeline runs).
- Demonstrates use of branching strategies ('main', 'mainj').

Section 2: Azure DevOps & Cloud Services



- Management of a project titled "thesis master atalantic azure."
- Engagement with cloud-hosted CI/CD platforms (Microsoft Azure Pipelines).

NotebookLM

Engagement with Civic and Law Enforcement Systems

The subject's activities include extensive interaction with the Metropolitan Police Service (UK), demonstrating a pattern of systematic engagement with complex official bodies.



Employment & Outreach

Activity: Numerous applications for roles such as Infrastructure Engineer, Business Analyst, and retired officer schemes.

Evidence:



Crime Reporting & Systemic Confusion

Activity: Submitted an online report to the police (Reference: MIP-482-24-0100-000).

System Response:

“The crime reference number is showing in the system as **not in existence**. Are you the victim? What is the nature of the crime?”

NotebookLM

Case File Summary & Critical Questions



Summary of Evidence

- **Educational Attainment:** N1-N6 coursework completed; N3 result remains "Under Investigation." National N-Diploma not awarded.
- **Professional Efforts:** Over 100 documented applications to major engineering, tech, and government employers. Rejection or no response is the common outcome.
- **Demonstrated Expertise:** Extensive portfolio of independent research, technical projects, and engagement with professional bodies in electrical engineering, control systems, and software development.
- **Systemic Engagement:** Methodical and persistent appeals filed with DHET, SAQA, and QCTO over a multi-year period with no definitive resolution.

Key Questions Raised

How can a candidate demonstrate years of consistent academic and technical effort yet remain formally unqualified due to a single, unresolved administrative issue?

What pathways exist for recognizing demonstrated, practical expertise when formal certification processes stall?

*At what point does the **burden of proof** shift from the persistent individual to the systems responsible for their evaluation and accreditation?*

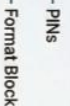
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A comparison of the documentation-focused military standard (MIL-STD-100G) with the hazard-based international safety standard (IEC 62368-1) for engineers and compliance professionals:

MIL-STD-100G is a U.S. Department of Defense standard governing the creation and control of engineering drawings. IEC 62368-1 is an international standard focused on product safety through hazard identification and mitigation. Understanding the intersection is crucial for ruggedized and safety-critical systems.

IEC 62368-1:2024: The Hazard-Based Approach

Defines precise rules for engineering drawings, part numbers (P/Ns), and formats.



Safety Through Critical

Manages safety by identifying and controlling Critical Safety Items (CSIs) on drawings.



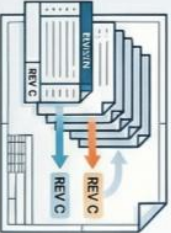
Safety Through Energy Source Classification

Classifies energy sources (electrical, thermal, etc.) into three levels to mitigate harm.



Class	Level
Class 1:	Low
Class 2:	Medium
Class 3:	High

Uses a rigid system of revision blocks and new PINs to track all changes.



Requires a new risk assessment if any change could affect a product's safety.



Navigating the Modern Technical Career Path

1. Start with Foundational Education

Begin with formal qualifications like National Accredited Technical Education Diploma (NATED) programs.



2. Develop Practical, Hands-On Skills

Gain experience through workshop projects, lab work, and trade test preparation.



3. Embrace Continuous Professional Development (CPD)

Use accredited online platforms for self-paced learning to acquire new, specialized skills.



Diploma
6-15 hours | In-depth knowledge across a subject area.

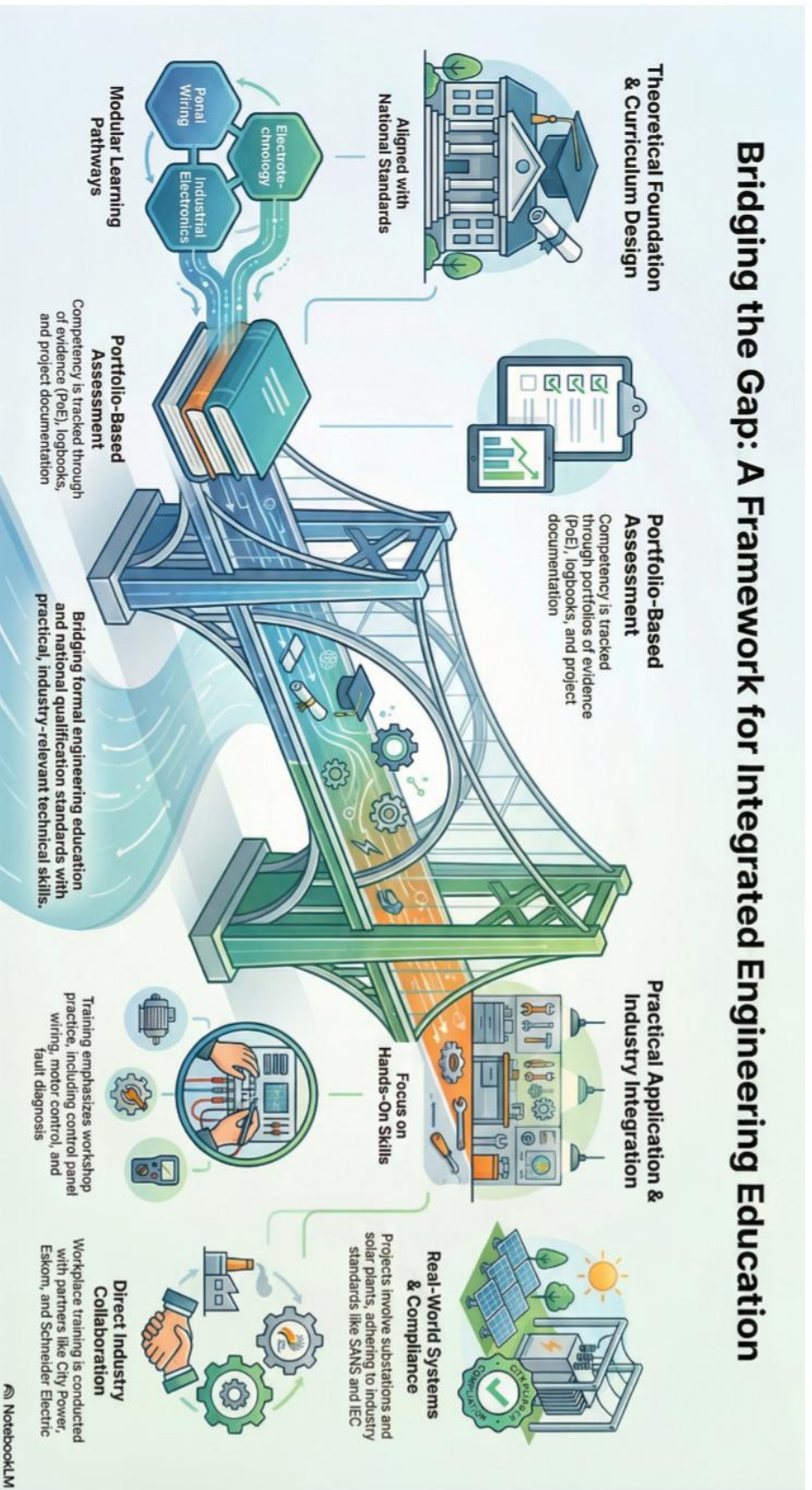
Certificate
Under 3 hours | Targeted learning on specific topics.

4. Build Your Professional Profile & Apply

Create a strong resume, build a portfolio, and apply for roles with industry leaders.



Bridging the Gap: A Framework for Integrated Engineering Education



Integrated Mastery: A Portfolio of Evidence in Engineering, Education, and Regulatory Compliance

Synthesizing Technical Depth, Quality Assurance, and Professional Resilience

NotebookLM

Five Pillars of Competence



Foundational Engineering & Academic Rigor

The accredited NATED/SAQA qualification pathway, demonstrating a solid, verifiable educational base.



Bridging Theory with Industry Practice

Evidence of applying academic knowledge in real-world industrial settings.



Expertise in Assessment & Quality Assurance

Deep knowledge of national assessment policies and the practical application of moderation standards.



Resilience & Professional Advocacy

Proven capacity for navigating complex legal and administrative systems to ensure compliance and advocate for professional rights.



Mastery of Global & Future-Focused Standards

Command over international and corporate technical standards, demonstrating continuous learning and global relevance.

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Pillar 1: Foundational Engineering & Academic Rigor

Grounded in the South African National Qualifications Framework (NQF)

Qualification Title

National N Diploma in Engineering (SAQA ID: 90674, NQF Level: 6).



Core Subjects

- Mathematics
- Engineering Science
- Electrical Trade Theory
- Industrial Electronics
- Electrotechnics
- Power Machines
- Control Systems
- Installation Rules

Visual Evidence



NotebookLM

A Detailed Look at Curriculum and Assessment Structure

ICASS Trimester Policy (Report 191)

Component	Weighting
Test 1	30%
Test 2	70%
Minimum to Qualify	40%
Validity	1 year

This structure ensures continuous assessment and syllabus coverage, forming the basis for examination entry.

Electrical Trade Theory N1 Module Weighting

Module	Weight Value (%)
DC theory	30
Wiring of premises	25
Magnetism and electromagnetism	10
Safety precautions	10
Other modules (Fire, Tools, etc.)	25

Demonstrates a curriculum heavily focused on foundational principles and practical application in wiring, governed by SANS 10142-1.

NotebookLM

Pillar 2: Bridging Theory with Industry Practice

Curriculum Validation and Portfolio Development at City Power Johannesburg

Objective

To align NATED Electrical Engineering studies with the operational realities of a major municipal utility.

Key Activities



Job Shadowing: Observing technicians in Metering, Test Branch, and Customer Interface units.



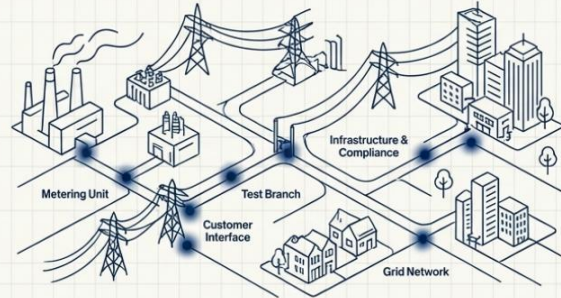
Site Inspections: Assessing infrastructure and compliance with technical standards.



Curriculum Validation: Engaging with City Power staff to ensure syllabi reflect current industry needs.



Portfolio of Evidence (PoE): Collecting verified evidence for the National Trade Portfolio.



Key Insight: The visit confirms the challenges of the sector (e.g., load shedding, service delivery complaints) and reinforces the need for graduates who are not only technically skilled but also resilient and adaptable.

NotebookLM

Pillar 4: Resilience & Professional Advocacy

A Proven Capacity for Navigating Complex Legal and Administrative Systems

This slide documents direct engagement with national statutory bodies as a demonstration of navigating formal systems to uphold professional and statutory rights.



Commission for Conciliation, Mediation and Arbitration (CCMA)

Engaged in formal dispute resolution processes regarding unfair dismissal claims.
(e.g., Case Ref GAJB6808-15).

From: ccmaonline@ccma.org.za
Sent: Tuesday 28 February 2023 09:04:04
Subject: CCMA Online Submission; ESKAS25300573A Acct#1 at Request (LRA Form 7.11) 71A.
From: ccmaonline@ccma.org.za
Sent: Tuesday 28 February 2023 09:04:04
To: CHIBELUJOS
Subject: CCMA Online Submission; ESKAS25300573A Acct#1 at Request (LRA Form 7.11) 71A.
Dear CHIBELUJOS,
Please note, that a submission has been made in your case, with regard to your request for arbitration and mediation under professional pressure.



Private Security Industry Regulatory Authority (PSIRA)

Filed formal complaints and engaged with the Private Security Sector Provident Fund regarding statutory obligations of employers.

LABOUR
SPECIAL COMPLAINT FORM-PRIVATE
SECURITY SECTOR PROVIDENT FUND
Dear valued customer,
1. We are pleased to inform you that your complaint has been received and is being processed.
2. We will advise you of the outcome of your complaint as soon as it has been resolved.
3. For further information, please contact us on 0800 123 456 or visit our website at www.psira.co.za.



Labour Court & DOJ

Utilized formal legal channels for arbitration outcomes and civil case management.

Case Number	Case Type	Status	Case Name
ESKAS25300573A	Unfair Dismissal	Open	CHIBELUJOS
ESKAS25300573A	Unfair Dismissal	Open	CHIBELUJOS
ESKAS25300573A	Unfair Dismissal	Open	CHIBELUJOS
ESKAS25300573A	Unfair Dismissal	Open	CHIBELUJOS
ESKAS25300573A	Unfair Dismissal	Open	CHIBELUJOS

The Insight

This experience demonstrates a robust understanding of labour law, procedural fairness, and the mechanisms for legal recourse, showcasing a capacity for advocacy and resilience under professional pressure.

NotebookLM

Pillar 5: Mastery of Global & Future-Focused Standards

Command of Mission-Critical U.S. Military & Defense Specifications

Featured Standard:: MIL-STD-11991B

General Standard for Parts, Materials, and Processes (PM&P)

Scope & Purpose



Defines requirements for managing PM&P across the entire lifecycle of military systems to ensure reliability, authenticity, and sustainment.

Key Concepts Mastered



Counterfeit Prevention: Strong emphasis on authenticity, authorized suppliers, and Certificates of Conformance (C of C).



COTS Evaluation: Provides criteria for assessing Commercial-Off-The-Shelf items for military use.



Derating: The practice of using components below their maximum ratings to improve reliability.



Lifecycle Management: Proactive management of component obsolescence.

The Insight

Expertise in these standards is critical for designing systems where failure is not an option, covering everything from counterfeit detection to corrosion prevention.

NotebookLM

Evidence of Application: Technical Data for High-Reliability Systems

Key Data Tables from MIL-STD-11991B for Audit-Ready Implementation

Table 1: PM&P Incoming Inspection Data Requirements (Appendix H)

Requirement	EEE parts	Mechanical parts	Notes
Database fields maintained for life	Yes	Yes	Lot date code, P.O. requirements, C of C data
Documented procedures for incoming tests	Yes	Yes	Define sampling, methods, acceptance criteria
Radiological inspection (X-ray)	Yes	Yes	Internal defects
DPA (Destructive Physical Analysis)	Required (one per lot)	—	See MIL-STD-1580
PIND (Particle Impact Noise Detection)	Categories A–C, T	—	Hermeticity/loose particles

Table 2: Microcircuit Derating Factors (Appendix A)

Critical Stress Parameter	Digital	Linear	Notes
Maximum Supply Voltage	0.90	0.80	Do not exceed 90% of max rating
Power Dissipation	0.80	0.75	Limit to 80% (digital), 75% (linear)
Max Junction Temperature	40°C below max	40°C below max	Applies across all devices

NotebookLM

Integrating Global Frameworks: A Comparative Analysis

Bridging Military Engineering Documentation (MIL-STD-100G) with International Safety Standards (IEC 62368-1:2024)

Dimension	MIL-STD-100G	IEC 62368-1:2024
Safety Focus	Critical Safety Items (CSI): Identifies specific components/characteristics requiring rigorous control.	Hazard-Based Safety Engineering (HBSE): Identifies energy sources and mandates safeguards.
Documentation	Prescriptive drawings identifying CSIs and requiring engineering evaluation of any changes.	Performance-based documentation of hazards, safeguards, and formal risk assessments.
Change Control	Formalized structure for numbering, identification (PINs, CAGE codes), and revision history.	Focus on the impact of changes on safety, requiring updated risk assessments.
Traceability	Achieved through PINs, CAGE codes, and government-controlled drawing revisions.	Achieved through critical component lists, test records, and supplier certifications.

Key Synthesis
For ruggedized and safety-critical systems, these approaches are complementary. MIL-STD-100G ensures traceability and control, while IEC 62368-1 ensures comprehensive hazard mitigation.

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Continuous Professional Development in Modern Corporate Ecosystems



Microsoft

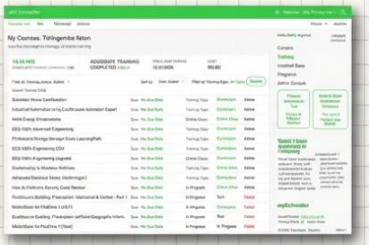
Certificate of Completion in **Engineering, Azure, GitHub**. Highlights proficiency in modern cloud and DevOps platforms. Over 943 modules and 756 training hours completed.





Schneider Electric

Active training in **EcoStruxure Automation Expert, Wind Energy Fundamentals, and Advanced Electrical Safety**. Demonstrates expertise in industrial automation and energy management.





EATON

CAREER AND UNIVERSITY®

Profile review and skills assessment in **Stakeholder Communication**, demonstrating soft skills alongside technical expertise.



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Microsoft Learn Transcript: A Record of Continuous Upskilling

Over 940 Modules and 750 Hours of Advanced Technical Training

943

Modules Completed



216

Learning Paths Completed



756 hr 38 min

Training Hours Completed



Selected Learning Path Completions

APL-2007: Accelerate app development by using GitHub Copilot

Learn how to accelerate app development by using GitHub Copilot and GitHub Copilot Chat in a Visual Studio Code environment. in Source Serif Pro Regular

Completed Oct 4, 2025

AI Fluency

A comprehensive understanding of AI fluency, from foundational concepts to advanced topics.

Completed Aug 28, 2025

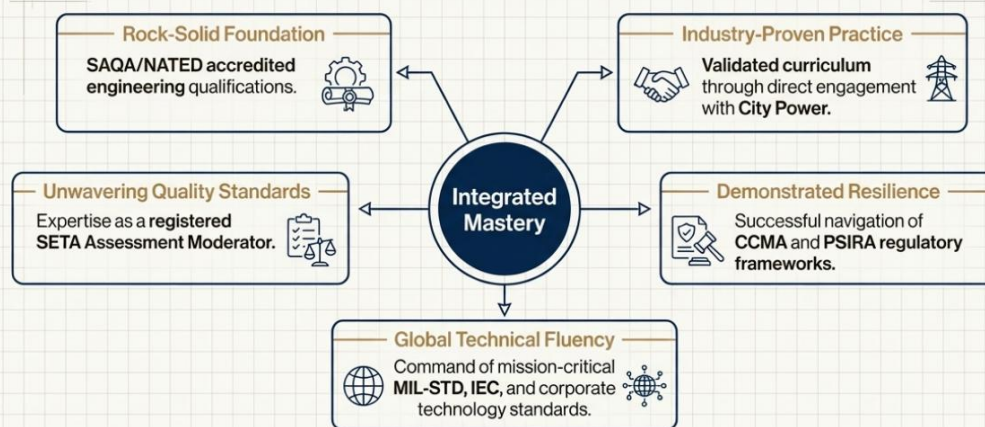
Build custom agents for Microsoft Teams

Build custom agents for your Microsoft Teams environment for your business needs.

Completed Nov 16, 2024

NotebookLM

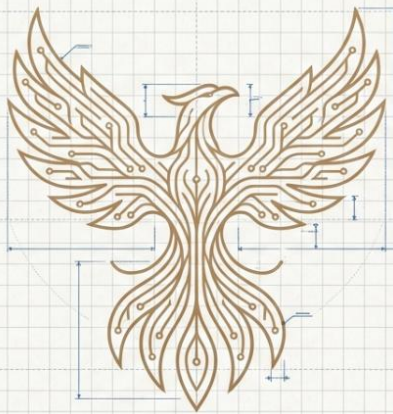
The Blueprint for Integrated Mastery



This portfolio demonstrates a rare synthesis of capabilities: the **technical precision** of an engineer, the **pedagogical rigor** of an educator, the strategic mindset of a **compliance expert**, and the **resilience** of a **professional advocate**. This is Integrated Mastery.

NotebookLM

The Phoenix Framework

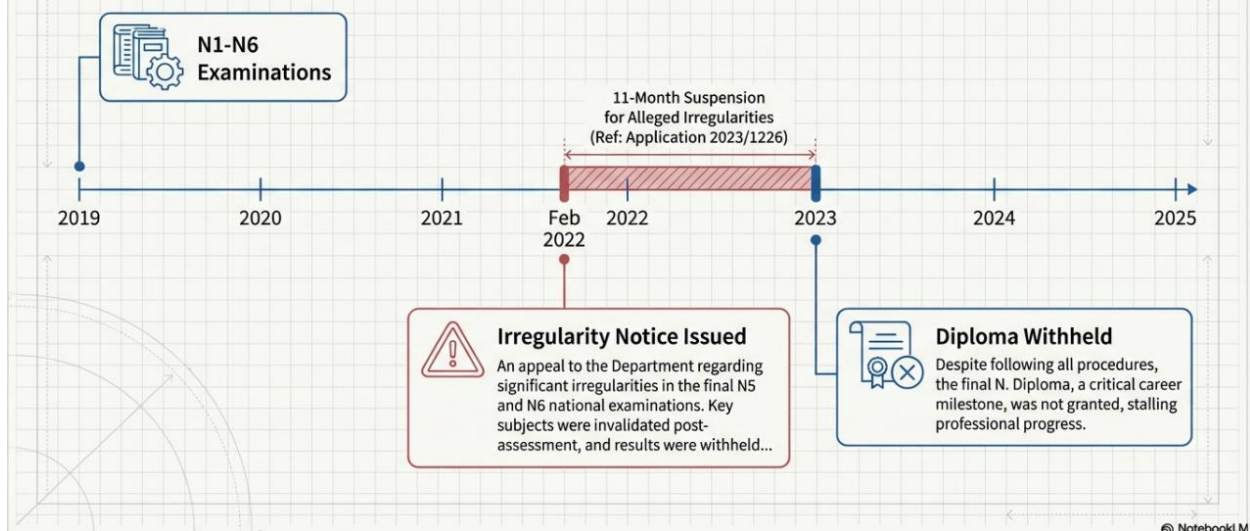


A Learner-Centric Blueprint for Technical Education Reform

Forged from experience, designed for the future.

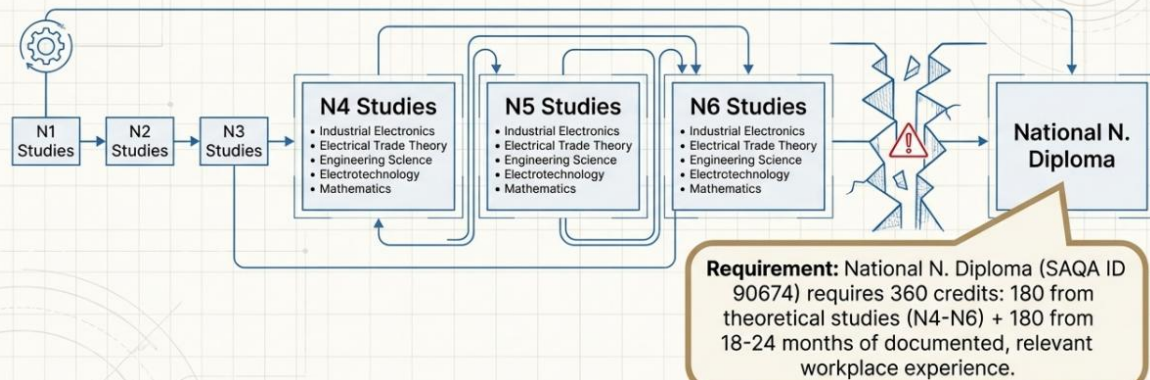
NotebookLM

The Catalyst: A Learner's Journey Through Systemic Friction



NotebookLM

Navigating the Qualification Maze: A Fragmented Pathway

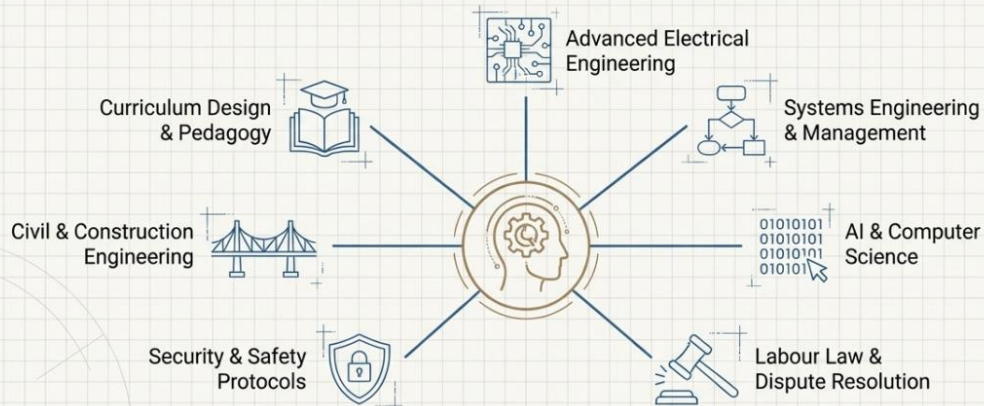


When examination and assessment irregularities disrupt this sequence, the **entire framework** fails the learner, rendering both theoretical and practical efforts unrecognized.

NotebookLM

From Obstacle to Opportunity: Forging a New Path Through Knowledge Synthesis

"When the system presented a barrier, the only viable response was to build a deeper and broader foundation of knowledge—one that could not only overcome the obstacle but also provide the tools to redesign the system itself."



NotebookLM

A Universe of Disciplines: Building a Holistic Expertise

Electrical Engineering

- Power System Analysis
- Symmetrical Faults
- AC/DC Machines
- RLC Circuits
- Transformer Design
- SANS 10142



AI & Computer Science

- Mathematics for AI
- Recursive Data Types
- State Machines
- The Halting Problem
- Number Theory
- RSA Public Key Encryption
- Logic Formulas



Systems Engineering

- Requirements Analysis
- Functional Allocation
- Design Synthesis
- Work Breakdown Structures
- Configuration Management
- MIL-STD standards



Law & Regulation

- Labour Relations Act (LRA)
- CCMA Processes
- Pension Funds Act
- Mine Health & Safety Act
- Firearms Control Act
- Private Security Industry Regulation Act (PSIRA)



Security & Policing

- Criminal Investigation
- Access Control (CCTV)
- Crime Scene Management
- Corporate Investigation
- Security Risk Assessment



Education & Pedagogy

- Curriculum Design
- Assessment Modeling
- NQF/SAQA Policy
- Facilitation
- Recognition of Prior Learning (RPL)
- CPD Frameworks



NotebookLM

Grounded in First Principles: A Deep Dive into Engineering Calculations

Formulas

DC Machines

$$\text{Speed } N = \frac{V - I_a \cdot R}{K \cdot \Phi}$$

$$\text{Torque } T = K \cdot \Phi \cdot I_a$$

RLC Circuits

$$\text{Impedance } Z = \sqrt{R^2 + (X_L - X_C)^2}$$

Power Factor

$$PF = \frac{P}{S} \text{ (Ratio of Real Power to Apparent Power)}$$

Derivatives in Signal Analysis

df/dx for partial derivatives

DF for total derivatives

Integrals for Energy

$$Q = \int I(t) dt \text{ to calculate total charge}$$

Application & Standards

Fault Calculation

Breakers calculated on a symmetrical current rating based on X/R ratio.

System Design

Design a distribution system.

Development of a system one-line.

Regulatory Compliance

Referencing standards like ANSI/IEEE C37.13, NPA 70-2014, and SANS 10142.

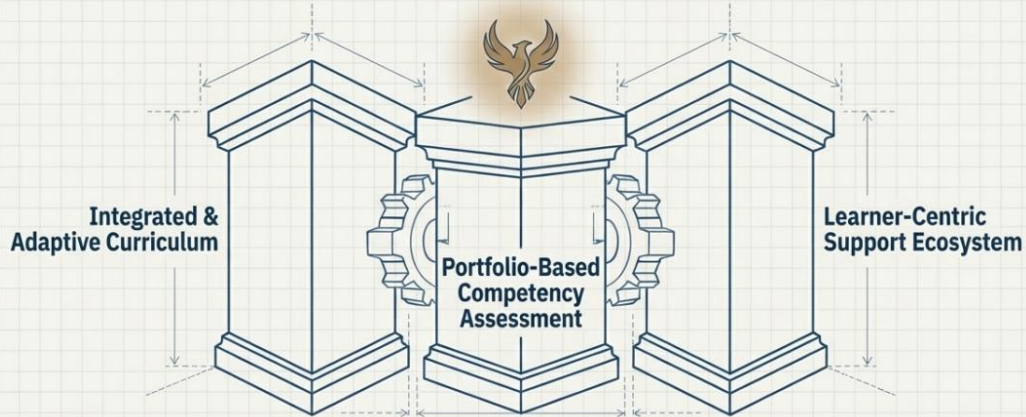
13.8 kV System & Transformer Analysis

System Component	X	R	X/R
13.8 kV System	0.98%	0.066%	15
Transformer	5.05%	0.65%	8
System Total	6.04%	0.716%	8

NotebookLM

The Synthesis: Introducing the Phoenix Framework for Technical Education

The Phoenix Framework is an integrated educational model designed to bridge the gap between theoretical knowledge, practical competency, and regulatory recognition. It is the direct outcome of synthesizing deep, multi-disciplinary expertise to solve the systemic frictions that hinder skilled learners.



NotebookLM



Pillar 1: An Integrated and Adaptive Curriculum

Key Principles



Multi-disciplinary by Design: Fuses core technical subjects (e.g., Electrotechnics) with essential contextual domains (e.g., Labour Law, Systems Management, Safety Compliance).



Industry-Aligned Modules: Curriculum content is directly mapped to occupational functions and industry standards (e.g., SANS, OHS Act).



Adaptive Learning Pathways: Allows for specialization while maintaining a strong foundational core, enabling learners to pursue paths in Engineering, Security, or Management.

Sample Curriculum Structure

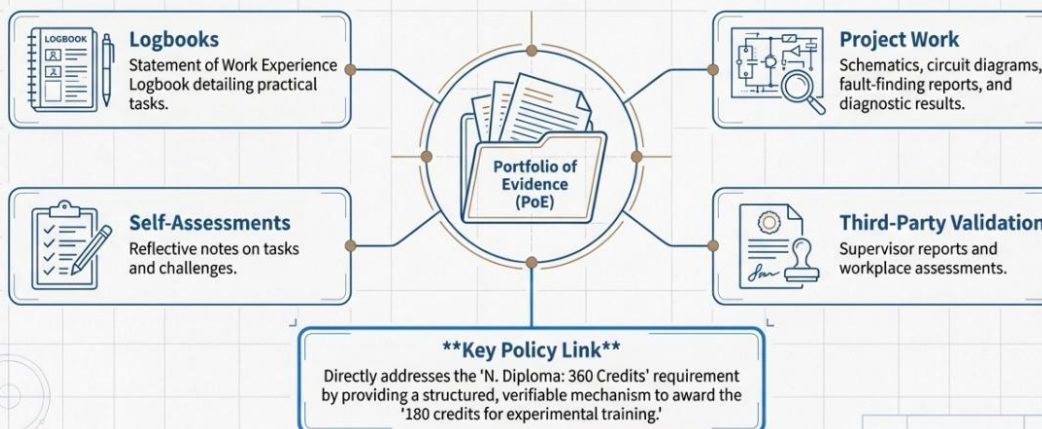
Course Title	Course Objectives	Course Description	Activity to carry out
Advanced Electrical Engineering in Construction and Civil Engineering	To integrate electrical systems within modern construction projects and understand sustainable energy solutions.	This course provides an in-depth understanding of electrical engineering principles and their applications in construction and civil engineering.	Analyze and design an electrical distribution system for a multi-story commercial building, ensuring compliance with SANS 10142.

NotebookLM



Pillar 2: Portfolio-Based Competency Assessment

Moving beyond a single point of failure. Competency is demonstrated through a comprehensive Portfolio of Evidence (PoE) that documents theoretical understanding, practical application, and workplace experience.



NotebookLM



Pillar 3: A Learner-Centric Support Ecosystem



Career Center Integration

Provides guidance on subject choice, study skills, and job searching, leveraging resources like the Sci-Bono Discovery Centre.



Structured Mentoring

Connects learners with experienced facilitators and industry mentors for practical advice and professional development.



Workplace Readiness Programs

Prepares learners for employment with modules on contracts, workplace etiquette, and on-the-job problem-solving.



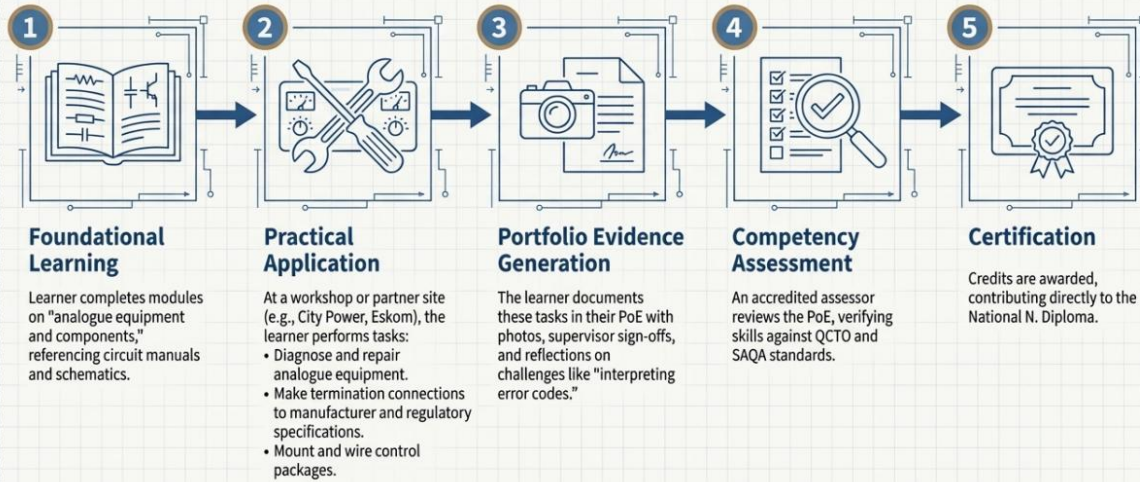
Self-Directed Learning Support

Encourages autobiographical research and self-built curricula to foster lifelong learning habits.

"We recommend the release of assessment results and the recording of assessment tasks to award the diploma... [and address] irregularities of script material... for future learner[s]."

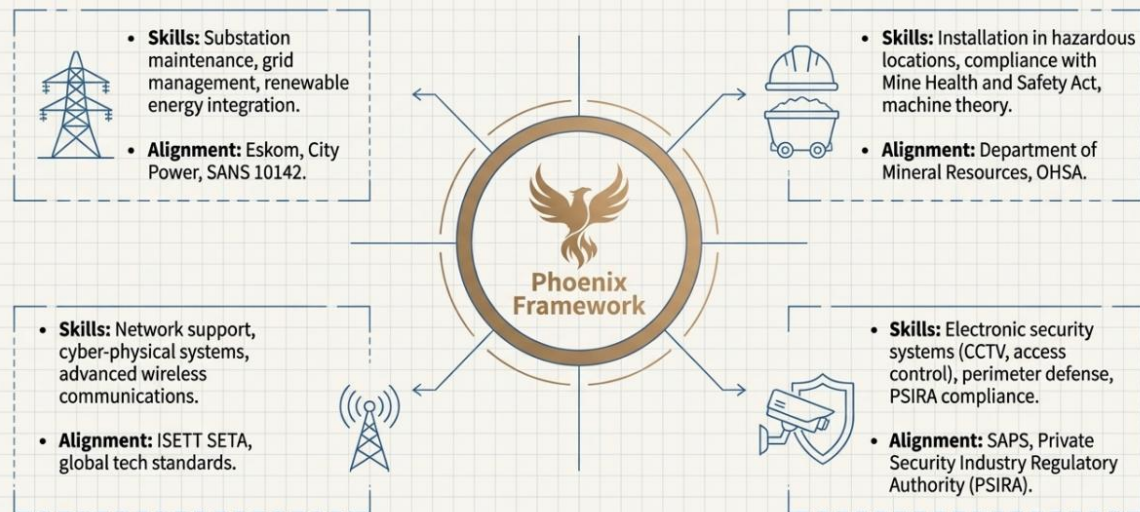
NotebookLM

The Framework in Action: A Case Study in Industrial Electronics & Control



NotebookLM

A Versatile Blueprint for Critical National Skills



NotebookLM

A Call to Action: Building the Future Together

1 Pilot Program

Partner with a TVET college and an industry stakeholder (e.g., City Power) to implement the Phoenix Framework for a cohort of electrical engineering learners.

2 Regulatory Collaboration

Establish a working group with SAQA and QCTO representatives to formalize the portfolio assessment criteria and ensure alignment with the National Qualifications Framework (NQF).

3 Curriculum Co-Design

Host workshops with industry experts to refine and expand the integrated curriculum modules, ensuring they meet current and future market demands.

This framework offers a proven, practical, and powerful path forward. Let us collaborate to build a technical education system that is resilient, responsive, and truly empowers its learners.

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The Blueprint is Ready.

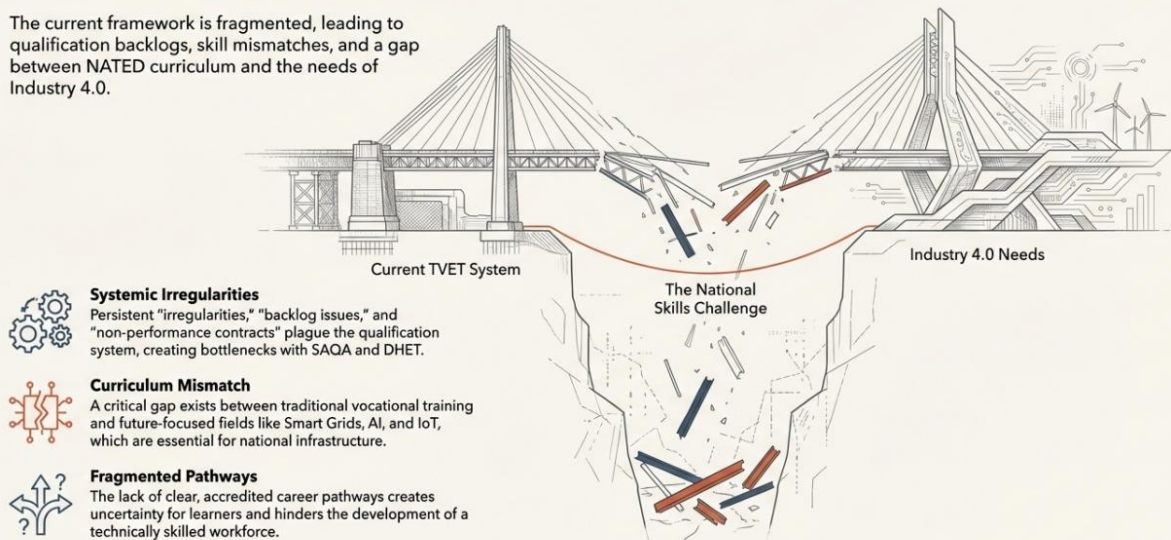


A system that recognizes potential, validates experience, and builds the future. One learner at a time.

NotebookLM

South Africa's Technical Education Is at a Crossroads

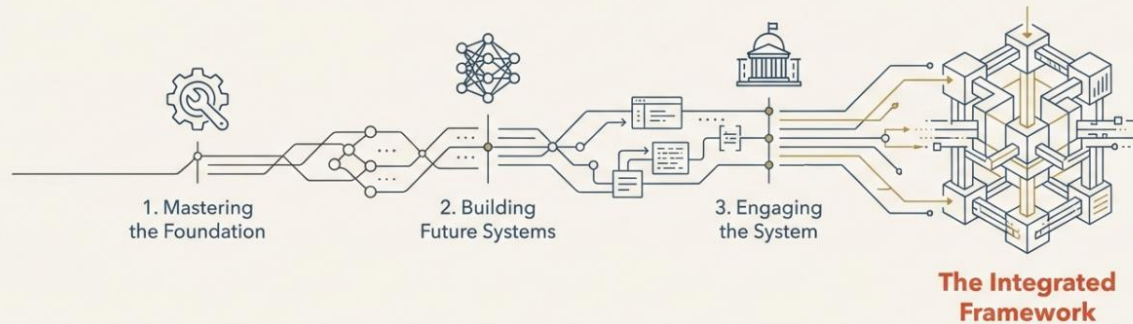
The current framework is fragmented, leading to qualification backlogs, skill mismatches, and a gap between NATED curriculum and the needs of Industry 4.0.



NotebookLM

Forging a New Path: An Integrated Framework for Engineering Excellence

To solve this challenge, a multi-year journey was undertaken to master foundational skills, build future-ready systems, and engage the regulatory landscape. The result is a cohesive framework that bridges theory, practice, and compliance.



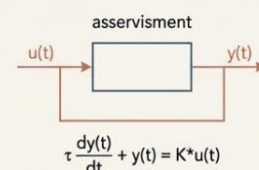
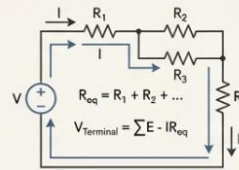
NotebookLM

Deep Expertise in Foundational Electrical Engineering and Trade Skills

Key Competencies

- **Electrical Trade Theory**
Mastery of core principles including Ohm's Law, AC/DC circuits, and power factor correction.
- **Industrial Electronics**
Application of semiconductor devices (diodes, thyristors, SCRs) in control systems.
- **Practical Workshop Skills**
Proficient in workshop practices including drilling, grinding, welding, and fabrication.
- **Fault Analysis & Panel Wiring**
Expertise in diagnosing and correcting faults in control panels, distribution boards, and motor control circuits.

Evidence Showcase



MERSETA framework checklist:

- ✓ Use fixed and portable drilling machines
- ✓ Sharpen drills
- ✓ Prepare material for arc weld
- ✓ Tack and arc weld work piece

NotebookLM

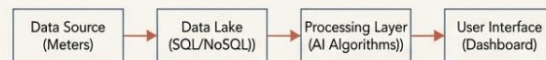
Integrating Advanced Concepts for Industry 4.0 and Smart Infrastructure

Key Competencies

- "Artificial General Intelligence (AGI): Exploring AGI's role in human-machine collaboration, its societal impact, and its contrast with narrow AI.
- "Smart Grids & IoT: Understanding real-time data collection, predictive maintenance for electric meters, and IoT applications in power systems.
- "Cybersecurity & Hacking: Principles of network security, including SSL/TLS protocols, threat analysis (POODLE, Heartbleed), and data protection.
- "Renewable Energy Systems: Exploring solar, wind, and hydro energy conversion, system efficiency, and e-commerce strategies for the renewable sector.

Evidence Showcase

- AGI in Human-Machine Collaboration
- Smart Grids and IoT Applications
- Cybersecurity and Hacking
- Online Retail and E-commerce in the Renewable Energy Sector



- CRISPR
- Blockchain Consensus Mechanisms
- Robotic Process Automation (RPA)

NotebookLM

Proactively Navigating the Regulatory and Funding Landscape to Drive Reform

Key Engagements

- **"Qualification Development"**
Formal submission to the Quality Council for Trades & Occupations (QCTO) to develop and realign the 'Engineering Electrical Trade Theory N4' qualification, addressing systemic gaps.
- **"National Funding Proposals"**
Application to the National Skills Fund (NSF) for an 'Engineering Electrical N4,5,6 Assessment Policy Implementation' project, targeting youth unemployment and skill development.
- **"Research & Development Incentives"**
Successful application for the DSI R&D Tax Incentive program for a project in 'Engineering Electrical,' linking innovation to fiscal policy.
- **"Labour Relations & Compliance"**
Deep analysis of labour law, including the Labour Relations Act (LRA), CCMA processes, and private security sector bargaining council agreements, to ensure frameworks are legally sound.

Evidence Showcase



QCTO Application for Qualification Development: Engineering Electrical Trade Theory N4.



NSF Project Proposal: Engineering Electrical N4,5,6 Assessment Policy Implementation.
Project Duration: 24 months.



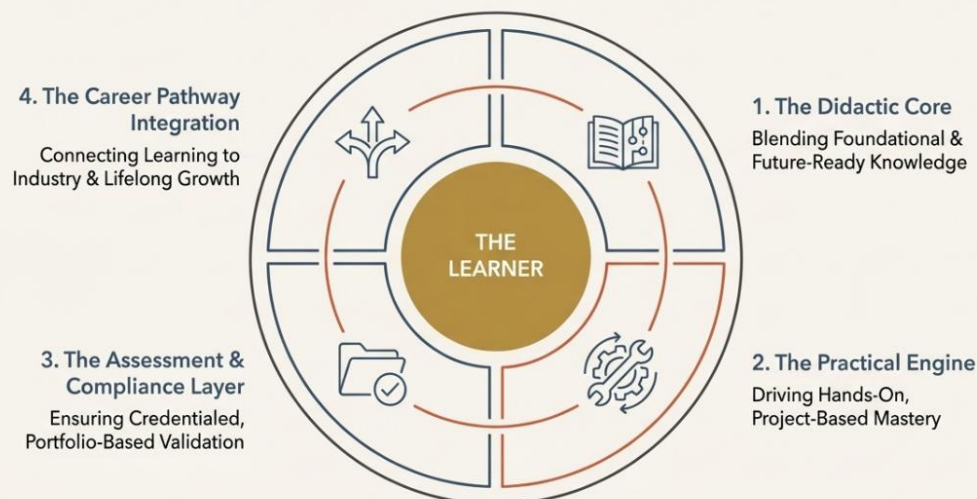
DSI R&D Tax Incentive Notification of Approval.
Registration No: 2013/034490/07.

- Labour Relations Act 66 of 1995
- Basic Conditions of Employment Act
- CCMA rules

NotebookLM

The Solution: An Integrated Framework for Technical and Vocational Excellence

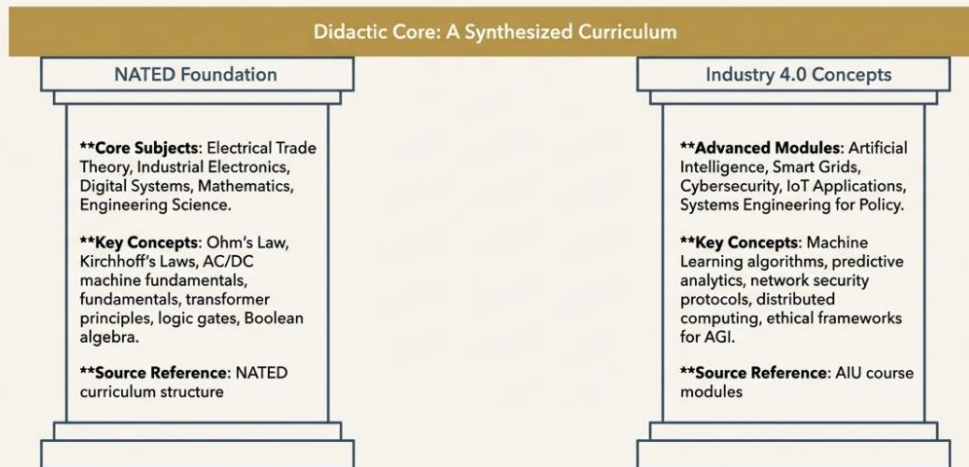
The Tshingombe Integrated Framework is a holistic, multi-layered model that synthesizes foundational theory, advanced concepts, practical application, and regulatory compliance into a single, cohesive educational pathway.



NotebookLM

Framework Component 1: The Didactic Core

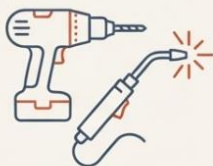
A Curriculum Blending Foundational NATED Theory with Advanced Systems Thinking



NotebookLM

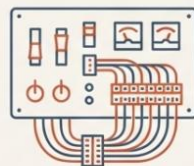
Framework Component 2: The Practical Engine

Project-Based Learning Rooted in Workshop Mastery and Real-World Application



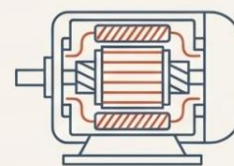
Workshop Fabrication & Assembly

- Fabricate a project to within $\pm 0,25$ mm dimensional tolerance.
- Sharpen drill angles according to material application.
- Prepare and execute manual metal arc welding and gas welding.



Control Panel Wiring & Testing

- Mount, wire, and connect switch boards, distribution boards, and motor controls.
- Fault-find on control panels for open circuits, short circuits, and single-phase faults.



AC/DC Machine Configuration

- Design and wire circuits for single-phase capacitor start motors (forward and reverse).
- Connect, test, and fault-find on DC series, shunt, and compound motors.

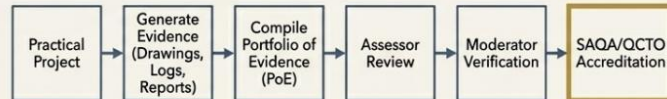
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Framework Component 3: The Assessment & Compliance Layer

A Portfolio-Based Assessment System Aligned with SAQA and QCTO Standards

Core Principles:

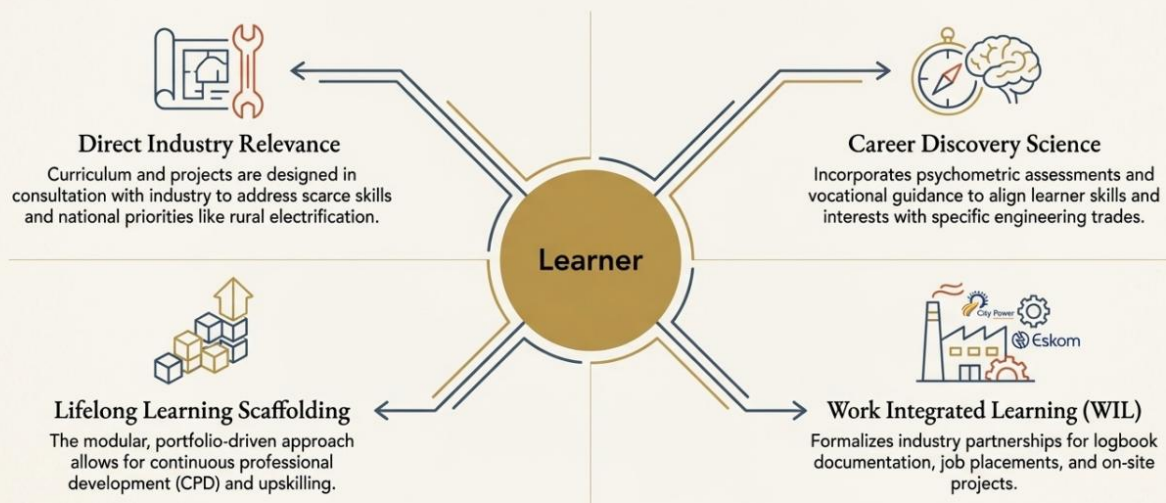
- **Outcome-Based Evaluation:** Assessment is based on demonstrated competence ("analysing a problem," "design a solution," "testing and reporting"), not just theoretical knowledge.
- **Portfolio of Evidence (PoE):** Learners compile a comprehensive PoE including project reports, schematics, fault-finding logs, and supervisor testimonials.
- **Assessor & Moderator Framework:** Utilizes trained assessors to ensure evaluation is Authentic, Valid, Current, and Sufficient.
- **NQF Level Alignment:** All outcomes are explicitly mapped to the South African National Qualifications Framework (NQF) levels for national recognition.



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Framework Component 4: The Career Pathway Integration

Connecting Education to Career Discovery and Industry Needs



NotebookLM

The Vision: Impact and Implementation

Powering the Future: A Case Study in Rural Electrification

Project Abstract:

Application of the integrated framework to address the challenge of rural electrification in South Africa, where a backlog of 3.4 million households exists.

Problem Analysis:

- Total rural unelectrified population = **10.0 million**
- Calculation: $52.89 \text{ million} \times 0.31 \times 0.62$

Solution Design:

Proposes the use of grid, off-grid, and PV-based hybrid systems, requiring skilled technicians for installation and maintenance.

System Calculations Showcase:

$$\text{Demand Factor} = \frac{\text{Maximum Demand}}{\text{Connected Load}}$$

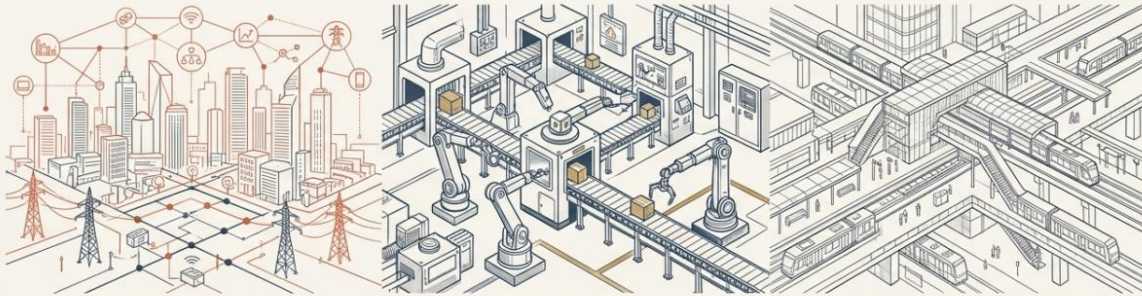
$$\text{Load Factor} = \frac{\text{Average Load}}{\text{Maximum Load}}$$

$$\text{Real Power (3-phase): } P = \sqrt{3} \times V_C \times I_C \times \cos(\theta)$$



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Building a Generation of Future-Ready Engineers to Strengthen National Infrastructure



Creating a Skilled Workforce

Graduates possess the verified skills to design, build, and maintain critical infrastructure, from smart grids and traffic management systems to industrial automation.

Enhancing Economic Competitiveness

By closing the skills gap, the framework supports the Industrial Policy Action Plan and strengthens local manufacturing and technology sectors.

Setting a New Benchmark for TVET

Establishes a model for excellence in technical education that is integrated, compliant, and responsive to the needs of the 21st-century economy.

"Engineering has existed since ancient times...exploiting basic mechanical principle to develop useful tools object. This framework continues that legacy for the digital age."

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A Foundation of Rigorous Research, Curriculum Design, and Intellectual Property

Selected Curriculum & Research Projects

- Implementation and framework national qualification and national trade examination circulum
- Career Discovery Science Application and Engineering Electrical Combination Framework
- AI Fluency Program (collaboration with Sci-Bono ICT Academy)
- Smart Factory Enhanced with Artificial Intelligence (DL I4.0 FACTORY-AI)
- Advanced Didactic Laboratories & AI-Enhanced Systems

Patents & Formal Submissions

Type	Title/Focus	Application No.	Status
Patent	Engineering Master Doctoral (Rural Focus)	520520	Granted
Curriculum	Career Discovery... NSF Learning Journey	30	Granted
Framework	Security, Safety, Defense Facilitation...	520525	Granted

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From a Fragmented System to an Integrated Future

The Challenge: A disconnected and outdated technical education system.

The Journey: A deliberate path of mastering foundational skills, building advanced systems, and engaging with the regulatory environment.

The Solution: The Tshingombe Integrated Framework—a proven, multi-layered model for developing the next generation of engineers.

This framework offers a clear, credentialed, and future-proof pathway to create a technically skilled workforce capable of building and maintaining South Africa's critical infrastructure.

Tshingombe Tshitadi Fiston
Engineering & Education Technology Specialist
tshingombekb@gmail.com
linkedin.com/in/tshingombe-fiston



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The Competency Profile of a Modern Engineer: From Core Principles to Advanced Technology

Foundational Engineering & Education



National N Diploma in Engineering (NQF Level 6)

Completed N1-N6 certificates in
Electrical Engineering under the
SAQA/DHET framework.



Qualified Assessor & Moderator

Expertise in South African
assessment policies (ICASS) and
curriculum engineering.



Expertise in Military & International Standards

Deep knowledge of MIL-STD-810
(Environmental Testing) and IEC
62368-1 (Safety).



Advanced Technical & Modern Skills



Proficient in AI & Automation Technologies

Skilled in Agentforce (Salesforce)
and GitHub Copilot tools for code
development.



Certified on Industry- Leading Platforms

Includes training from Schneider
Electric, Eaton, and
Salesforce Trailhead.



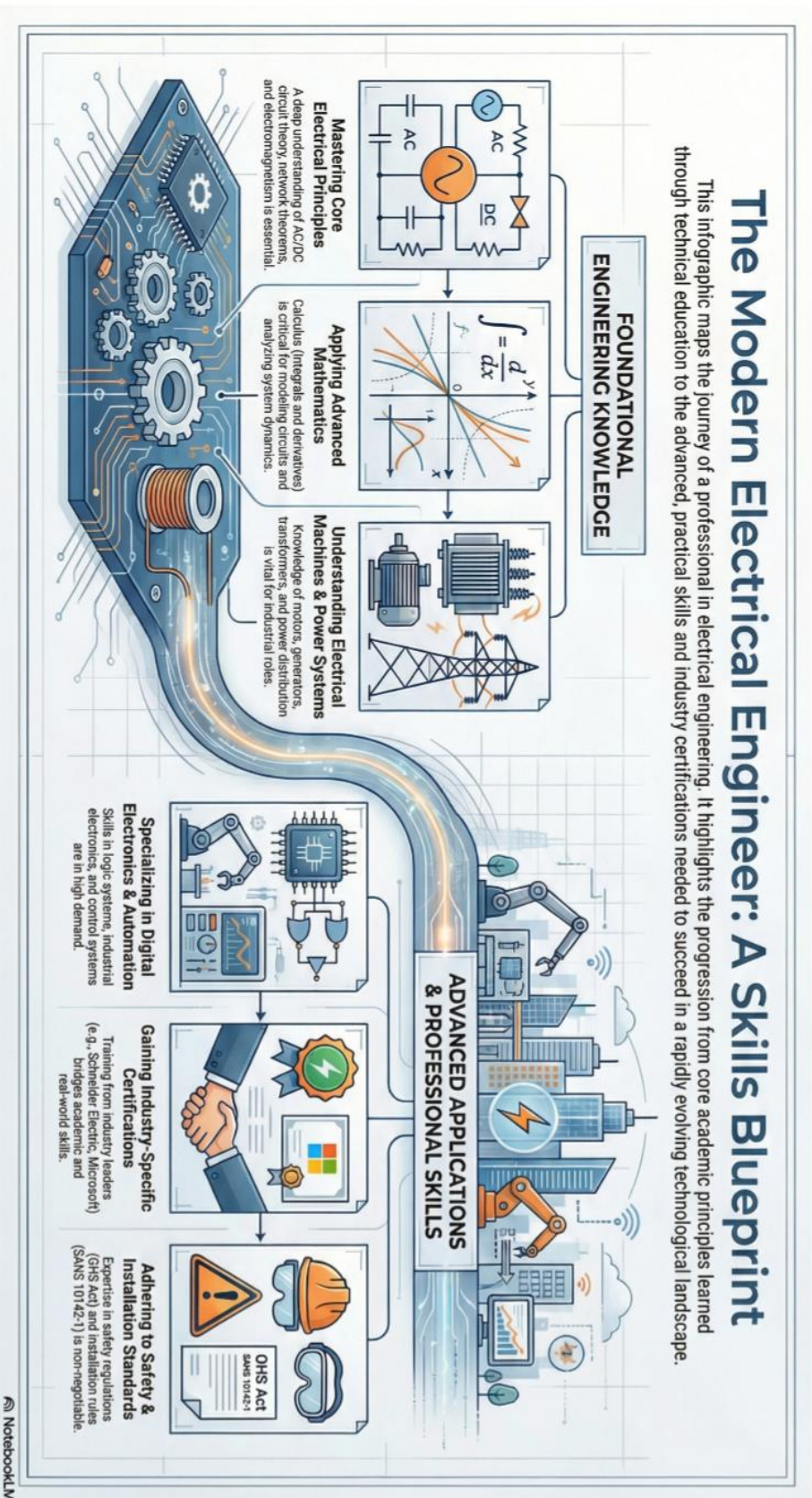
Skills in Modern Software Development

Completed modules in C#
programming and GitHub
administration via Microsoft Learn.



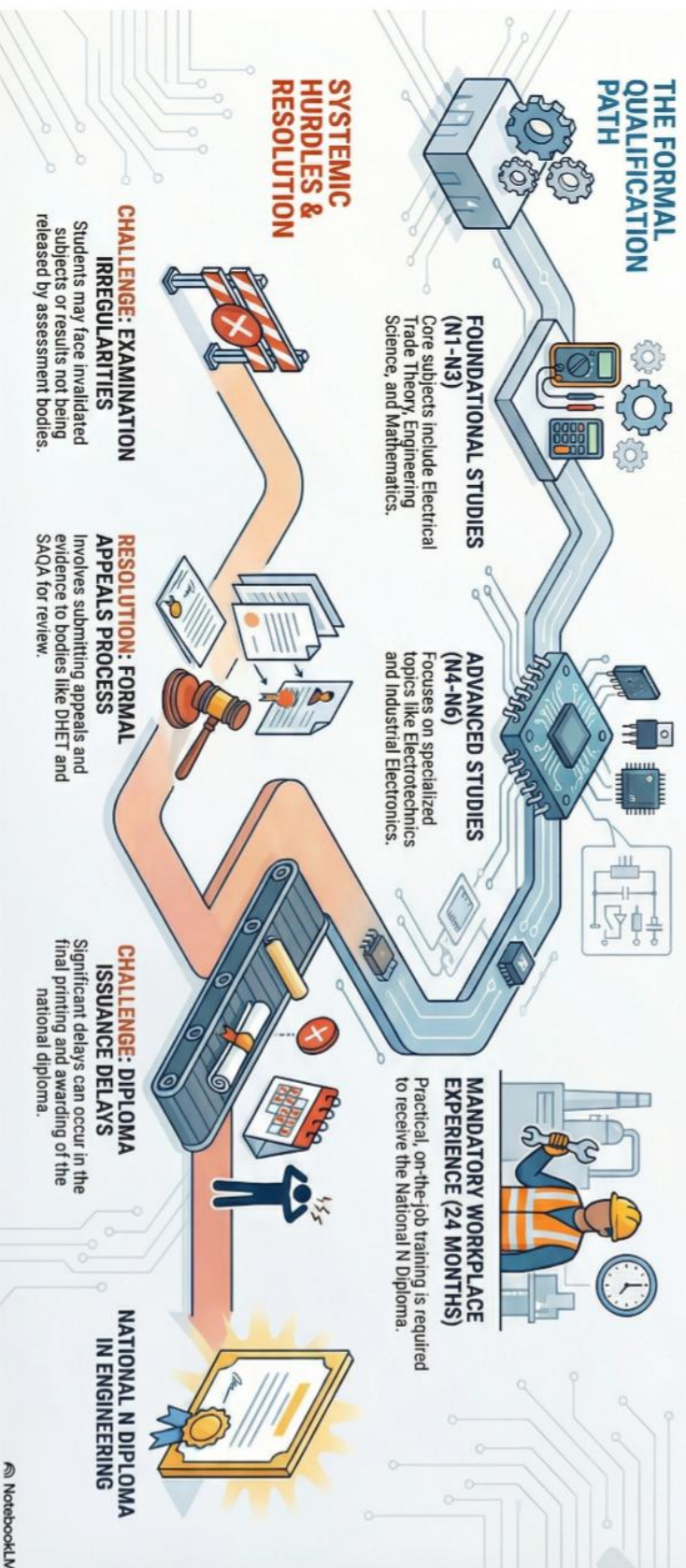
The Modern Electrical Engineer: A Skills Blueprint

This infographic maps the journey of a professional in electrical engineering. It highlights the progression from core academic principles learned through technical education to the advanced, practical skills and industry certifications needed to succeed in a rapidly evolving technological landscape.



The Path to an Electrical Engineering Diploma in South Africa

Navigating the multi-stage process and potential challenges of obtaining a National N Diploma in Engineering through the TVET college system.



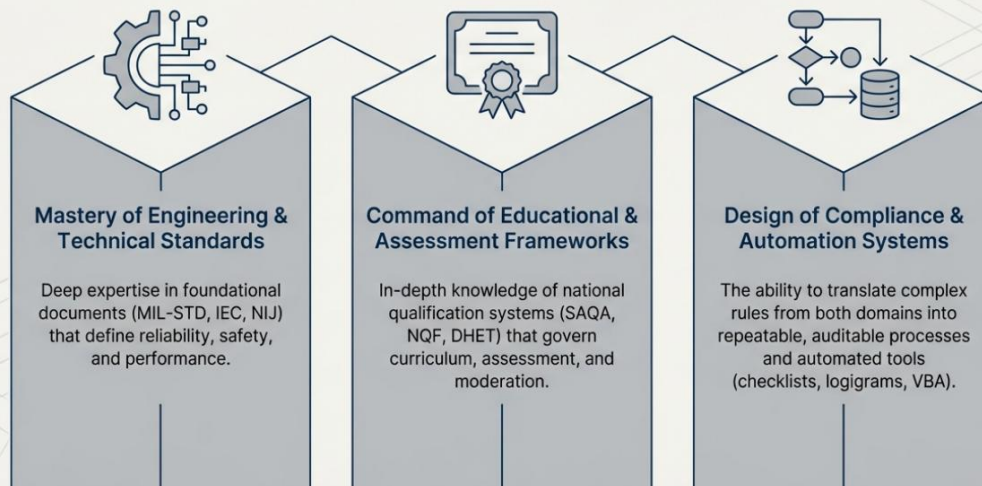


A Systems Approach to Engineering Compliance and Educational Integrity

Synthesizing Military-Grade Standards with National Qualification Frameworks to Build Repeatable, Auditable Systems for Quality Assurance.

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Three Pillars Form the Foundation of This Integrated System



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Mastery of Foundational Engineering Standards is the Bedrock of System Reliability



MIL-STD-11991B

Governs Parts, Materials, and Processes (PM&P) for military systems, ensuring reliability, authenticity, and lifecycle management of components, including COTS items.

MIL-STD-202G

Defines test methods for electronic and electrical component parts, covering environmental stresses like thermal shock, vibration, and moisture resistance.

MIL-STD-810H

The standard for environmental engineering considerations and laboratory tests, ensuring equipment can survive its service life in harsh conditions (temperature, shock, humidity).

MIL-STD-100G & IEC 62368-1

Establishes engineering drawing practices for the DoD, ensuring traceability and control, while IEC 62368-1 provides a hazard-based approach to product safety for commercial electronics.

NIJ 0101.06

The U.S. National Institute of Justice standard for ballistic resistance of body armor, defining test methods and performance requirements.

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Rigorous Incoming Inspection Protocols Translate Standards into Actionable Quality Control



Table: PM&P Incoming Inspection Data Requirements (Appendix H, H.2.1)

Requirement	EEE parts	Mechanical parts	Materials	Key Notes
Database fields (life of program)	Yes	Yes	Yes	Lot date code, P.O. requirements, C of C data
Documented procedures	Yes	Yes	Yes	Must define sampling, methods, acceptance criteria
Radiological inspection (X-ray)	As applicable	Yes	—	Verifies internal defects
DPA (Destructive Physical Analysis)	Cat. A-B required	—	—	Not a standalone counterfeit test; see MIL-STD-1580
PIND (Particle Impact Noise)	Cat. A-C, T	—	—	Detects loose particles in hermetic devices
XRF (X-ray fluorescence)	Yes	—	—	Checks for coating/material discrepancies (e.g., pure tin)
Certificate of Conformance (C of C)	Yes	Yes	Yes	Must be traceable and verifiable

Why It Matters
These protocols are the first line of defense against counterfeit parts and component failure, ensuring that every part entering the supply chain is authentic, traceable, and meets specification.

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Applying Derating Factors is Critical for Ensuring Long-Term Component Reliability

Microcircuit Derating Factors (Table AVI)	
Max Supply Voltage	0.90 (Digital), 0.80 (Linear)
Power Dissipation	0.80 (Digital), 0.75 (Linear)
Max Junction Temp	40°C below max rating

Capacitor Derating Factors (Table AI)	
Voltage Derating Factor	0.50 (for Ceramic, Glass, Film, Mica, Tantalum)
Max Case Temperature	20°C below max rating (most types)
Aluminum Electrolytic	Not allowed

EMI Filter Derating Factors (Table AIV)	
Rated Current	0.75
Rated Voltage	0.50
Max Operating Temp	30°C below manufacturer's max

Optoelectronic Device Derating Factors (Table AVII)	
Power Dissipation	0.50
Forward Current / Voltage	0.70
Max Temperature	30°C below max



Why It Matters

Derating is a proactive engineering practice that prevents premature failure by ensuring components operate well below their maximum stress limits. This is fundamental to building systems that are not just functional, but survivable.

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A Rigorous Command of National Educational Frameworks Ensures Qualification Integrity

Key Regulatory Bodies



department
higher education
Department
Higher Education and Training
REPUBLIC AFRICA

Sets policy and oversees TVET colleges.



Manages the NQF and ensures quality and standardization.



Manages occupational qualifications.

The National N Diploma Pathway (SAQA ID 90674 / NQF Level 6)

Requires completion of **N4**, **N5**, and **N6** certificates plus **24 months** of relevant practical experience. N4-N6 subjects build from foundational to advanced topics.



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Detailed Knowledge of Assessment Policy is Essential for Fair and Valid Moderation

ICASS (Internal Continuous Assessment) Structure

Component	Weighting	Notes
Test 1	30%	Covers first 30% of syllabus
Test 2	70%	Covers 75-80% of syllabus

A minimum ICASS mark of **40%** is required to qualify for the final exam.

Final Examination Rules (Example: Electrical Trade Theory)

Cognitive Weighting

- Knowledge: 60%
- Understanding: 20%
- Application: 15%
- Evaluation: 5%

Module Weighting (N1 Electrical Trade Theory)

- DC Theory: 30%
- Wiring of premises: 25%
- Safety precautions: 10%
- Other modules: 35%

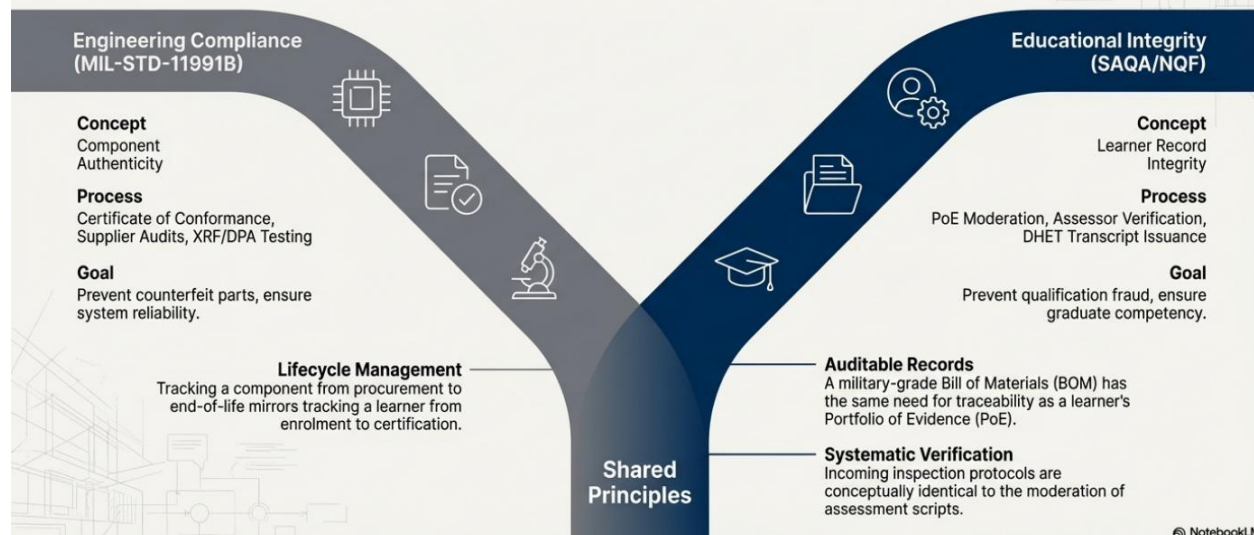


Why It Matters

A granular understanding of these weightings is critical for designing fair assessments, moderating results effectively, and ensuring that learner outcomes align precisely with the curriculum's objectives.

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Engineering Principles of Traceability and Validation Directly Translate to Educational Quality Assurance

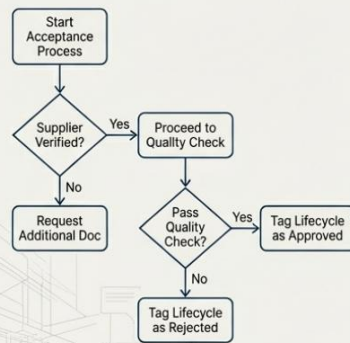


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Complex Compliance Requirements are Managed by Building Repeatable, Auditable Systems

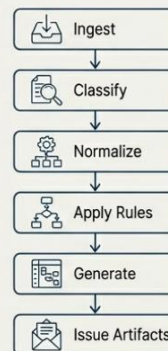
Logigrams (Logic Diagrams)

Use Case: Mapping decision flows for complex processes.



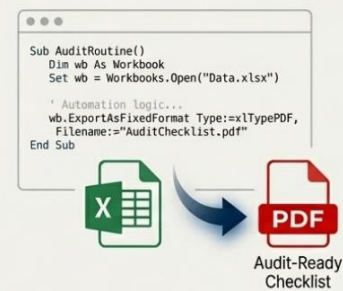
Algorigrams (Algorithm Diagrams)

Use Case: Representing sequential audit routines and workflows.



Visual Basic for Applications (VBA) Modules

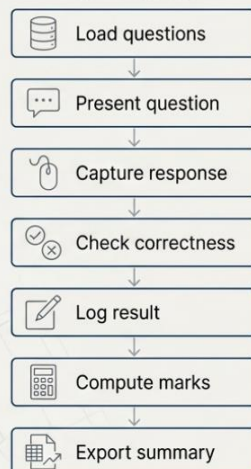
Use Case: Automating data-intensive tasks in MS Office.



NotebookLM

Automation Translates Theory into Practical Tools for Assessment and Auditing

Quiz Process



VBA Module Structure

Data Model ('modQuiz')

```

Public Type QuizItem
    Id As Long
    Question As String
    Options(1 To 4) As String
    CorrectOptionIndex As Integer
    Explanation As String
End Type
  
```

Controller ('RunQuiz')

Manages the quiz flow, prompting for input and scoring responses.

User Interface ('frmQuiz')

A user form with controls (labels, option buttons, command buttons) to present the quiz visually.

Export ('modExport')

```

ws.Range("A1:E1").Value = Array("ItemId", "SelectedIndex",
    "IsCorrect", "Timestamp", "Explanation")
  
```

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Expertise is Applied Across Corporate Training, Public Utilities, and Global Engineering Firms

Schneider Electric

COURSE	STATUS	START DATE	END DATE	PROGRESS
Electrical Engineering	Completed	2018-01-01	2018-01-01	100%
Electrical Engineering	Completed	2018-01-01	2018-01-01	100%
Electrical Engineering	Completed	2018-01-01	2018-01-01	100%
Electrical Engineering	Completed	2018-01-01	2018-01-01	100%
Electrical Engineering	Completed	2018-01-01	2018-01-01	100%
Electrical Engineering	Completed	2018-01-01	2018-01-01	100%
Electrical Engineering	Completed	2018-01-01	2018-01-01	100%
Electrical Engineering	Completed	2018-01-01	2018-01-01	100%
Electrical Engineering	Completed	2018-01-01	2018-01-01	100%
Electrical Engineering	Completed	2018-01-01	2018-01-01	100%

Demonstrates commitment to continuous professional development with a leading global specialist in energy management and automation.

Eaton

PROFILE REVIEW
Issued to
Tshingombe
Skill Assessment
Self-assess your skills to provide additional context to recruit reviewing your application and profile.
All Skills
Stakeholder Communication Expert
The last time the skill was utilized
Jacobs Engineering (Engineering)

Shows active engagement and skill validation with a major multinational power management company.

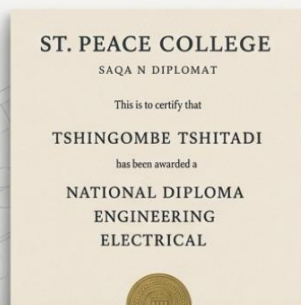
Eskom & City Power

Activities: Submission of applications for technical and training roles (e.g., "Snr Technician," "Officer Education and Training"). Research conducted on-site at City Power by NATED engineering students to align curriculum with practical industry needs.

Highlights involvement with key public utility providers, including role applications and practical research partnerships.

NotebookLM

Formal Qualifications and Certifications Validate Both Technical Mastery and Assessment Authority



department
higher education
Department
Higher Education and Training
REPUBLIC OF
SOUTH AFRICA
SAQA
CERTIFICATE AND DIPLOMA
This is to certify that
TSHINGOMBE TSHITADI
has satisfied the following whereupon
CERTIFICATE AND DIPLOMA
is hereby awarded

NQF LEVEL	SUBJECT	RESULT
N1	Mathematics	Passed
N2	Engineering Science	Passed
N3	Electrical Trade Theory	Passed
N4	Electrotechnics	Passed
N5	Industrial Orientation	Passed
N6	Industrial	Passed
N6	Plant	Passed



- Achieved National N Diploma in Electrical Engineering, the culmination of N1-N6 theoretical studies and practical experience.
- Certified as a Moderator and Assessor by SASSETA, a formal designation of competence in educational quality assurance.
- Transcript records from DHET and SAQA provide a fully auditable trail of academic progress and achievement.

NotebookLM

Systematic Documentation and Compliance Expertise are Deployed to Navigate Complex Legal and Regulatory Challenges

CCMA and Labour Court Proceedings



- **Issue:** Unfair dismissal claims and arbitration.
- **Action:** Filed formal arbitration requests (e.g., LRA Form 7.13, Case Ref GAJB6808-15) and navigated procedural requirements.
- **Outcome:** Demonstrates proficiency in compiling and submitting evidence-based legal documentation.

PSIRA Complaint Records



- **Issue:** Filed against a security employer regarding provident fund contributions.
- **Action:** Submitted 'Special Complaint Form' referencing the Levies Collective Agreement (Gazette No.42975).
- **Outcome:** Shows application of regulatory knowledge to hold organizations accountable to statutory obligations.

SAPS & Civil Cases



- **Context:** Documentation of witness statements and point-out notes at Hillbrow SAPS; management of civil cases through the court system.
- **Outcome:** Highlights meticulous record-keeping and evidence management in formal investigations.

A Comprehensive Portfolio of Evidence Substantiates Expertise Across All Domains

Engineering & Technical Standards



- Analysis reports on MIL-STD-11991B, MIL-STD-202G, MIL-STD-810H, IEC 62368-1.

Demonstrates: Deep knowledge of reliability, testing, and safety protocols.

Formal Academic & Professional Qualifications



- National N Diploma (Electrical Engineering), DHET/SAQA Transcripts (N1-N6), SASSETA Assessor/Moderator Certificate.

Demonstrates: Certified mastery of engineering curriculum and educational assessment.

Corporate & Industry Engagement



- Schneider Electric & Eaton training transcripts, Eskom & SARB application records, City Power site visit reports.

Demonstrates: Application of skills in leading corporate and public sector environments.

Regulatory & Legal Documentation



- CCMA arbitration filings, PSIRA complaint forms, SAPS witness statements, Labour Court records.

Demonstrates: Ability to apply systematic, evidence-based principles in high-stakes disputes.

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The Synthesis of Engineering Rigor and Educational Principle Creates Systems That Build Trust and Guarantee Quality

The discipline required to ensure a military-grade component is authentic is the same discipline needed to validate a learner's qualification. Both demand a system built on clear standards, rigorous verification, and auditable evidence. By integrating the principles of high-reliability engineering with the frameworks of national education, we can build robust, repeatable systems that ensure integrity—whether that integrity is in a circuit board on a battlefield or in a diploma hanging on a wall.

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The Engineer's Dual Challenge: Navigating Technical Mastery and Bureaucratic Hurdles

THE TECHNICAL MOUNTAIN: ACHIEVING MASTERY

Your Diploma is Just the Tutorial Level
Continuous learning and certifications in AI, cloud computing, and cybersecurity are vital.

Industry-Standard Competencies are Essential

Industry-grade Electronics

Mastery must span industrial automation, power systems, and military-grade electronics standards.

Technical is the New Theoretical
Vocational engineering requires advanced calculus, physics, and complex problem-solving skills.



An Engineer's Journey: The Quest for Professional Recognition

THE PURSUIT OF KNOWLEDGE & CREDENTIALS

Developing Research & Innovation Proposals

Submitting project pitches on advanced manufacturing and educational technology to research bodies.

Leveraging Global E-Learning Platforms

Using online provider Alison for courses, assessments, and career planning tools.

Pursuing National Vocational Diplomas

Engaging with TVET colleges for N1-N6 qualifications in Electrical Engineering.

SYSTEMIC BARRIERS & OUTCOMES

"National Science Foundation (NSF) Application Status: 'Declined'"

Reason cited: "The applicant does not meet the eligibility requirements."

Facing Certification Hurdles

Appeals citing examination "irregularities" and "backlogs" delaying diploma awards.

Unpaid Publication Invoice: \$99

For a research paper submission to the "Engineering Research Publication" journal.

The Competency Profile of a Modern Engineer: From Core Principles to Advanced Technology

Foundational Engineering & Education



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Proficient in AI & Automation Technologies

Skilled in Agentforce (Salesforce)
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Certified on Industry- Leading Platforms

Includes training from Schneider
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Skills in Modern Software Development

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The Expertise Framework: Synthesizing Electrical Mastery, Systems Integration, and Pedagogical Innovation

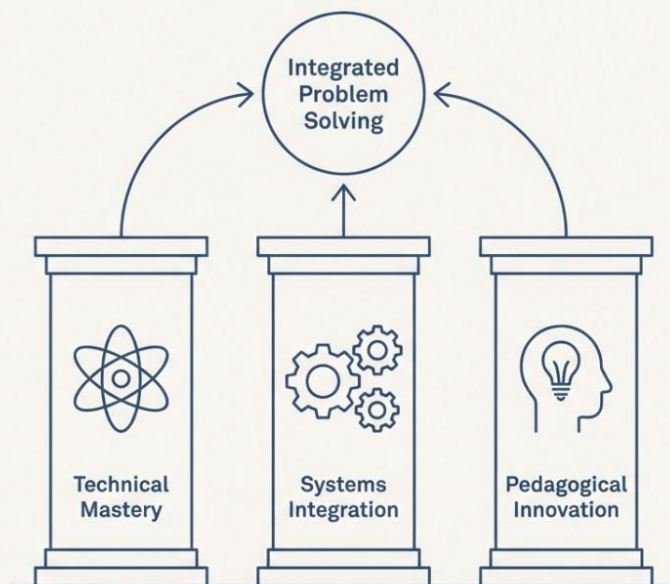
A presentation on a unified model for solving complex 21st-century socio-technical challenges.

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The framework was deliberately constructed to bridge deep theory with practical application.

This presentation outlines a unique, multi-disciplinary framework developed over years of rigorous study, practical application, and systemic analysis. It is not a chronological resume, but a blueprint of capability.

The framework integrates foundational engineering science, macro-level systems management, and innovative educational design to create holistic, sustainable solutions.



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Foundational expertise is rooted in a comprehensive N1-N6 engineering curriculum.

A deep, theoretical understanding of electrical and electronic principles forms the core of the framework. This knowledge, acquired through the NATED N1-N6 program, covers the full spectrum from basic circuit theory to advanced industrial electronics.

Key Subjects

- Electrical Trade Theory (N1-N3)
- Electrotechnics (N4-N6)
- Industrial Electronics (N4-N6)
- Engineering Science (N4)
- Mathematics (N4-N6)

Proof Point

AC Circuit Analysis

Calculation of impedance in complex RLC circuits using the formula:

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

Proof Point

Instrument Analysis

Derivation of full-range voltage in measuring instruments:

$$V = V_m (1 + R_{se}/R_m)$$

Proof Point

Electromagnetism

Application of Faraday's Law to calculate induced EMF:

$$e = d/dt(Li)$$

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Technical proficiency is continuously updated with industry-standard certifications and tools.

Beyond foundational academics, expertise is maintained and expanded through targeted training with global technology leaders. This ensures skills remain current and aligned with the latest advancements in IT, cloud computing, power systems, and cybersecurity.



Certifications

- Introduction to Data Engineering on Azure
- Configure Network Security
- Perform Device Investigation in Microsoft Defender for Endpoint

Credential ID

MCID 995871759



Training

- Ecostruxure Power: Energy Modeling and Verification
- Drives Fundamentals of Kinematic Calculation
- Secure Power Virtual Certification

Practical Application

Bill of Materials for a Modicon M340 processor and a variable speed drive (ATV 12Hu22M2)



Certification

(ISC)² Certified in Cybersecurity

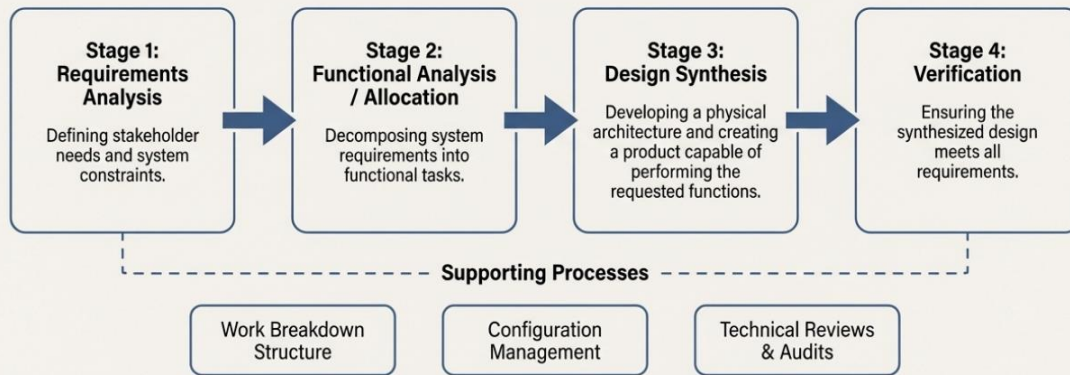
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Technical knowledge is applied through a disciplined systems engineering management process.

Individual technical skills are unified and scaled through a systematic approach to project and systems management. This ensures that solutions are not just technically sound but also effectively designed, implemented, and verified to meet complex requirements.



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The framework is applied to design and optimize critical public infrastructure systems

The systems approach has been successfully applied to model and propose solutions for law enforcement and traffic management, demonstrating the capability to handle large-scale, data-intensive public systems.



Police Management Information Systems

Designing Real-Time Crime Record Management for National Security

Key Features

- Use Case Diagrams, Entity-Relation Diagrams, Data Flow Diagrams (DFD), installation of LAN/WAN topologies, establishment of a central data center

Objective

To create an e-government police system that is public-accessible, reduces crime, and increases citizen safety.



Traffic Systems Management

A Systematic Process for Traffic Signal Installation and Management

Process Steps

1. Candidate Site Identification
2. Warranty Study
3. Signal Design (including geometric improvements)
4. Installation
5. Commissioning

Key Tool

Use of a detailed checklist for approving traffic signal designs by a registered professional engineer.

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Systems thinking drives innovation in industrial automation and secure financial processing.

The framework's principles have been used to propose industrial research programs, configure automated systems, and work within the highly secure environment of the national reserve bank.



DTIC THRIP Proposal

Tshingombe Tshitadi Engineering

Implementation of a framework circuit college for a Master's degree qualification in Electrical Engineering, targeting government systems assessment with City Power & Eskom.

Requested amount:

R20,000,000



SARB (South African Reserve Bank)

Bank Note Processor

Department: Cash Center, JHB

Involved analysis of high-speed banknote processing machines (1200 notes/min) and ATM technology.



City Power

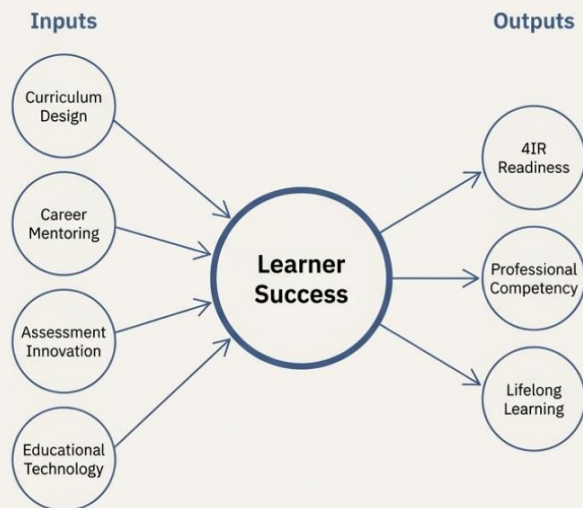
Practical experience with metering systems, including building-mounted meter bases near the service entrance.

Work involved standards like IEC 62053-22 (Electricity metering equipment) and SANS 10142-1.

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A commitment to education involves designing and delivering modern technical curricula.

True expertise includes the ability to transfer knowledge. This pillar focuses on creating innovative educational frameworks, mentoring the next generation of engineers, and leveraging technology to make learning more effective and accessible. The approach is grounded in outcome-based education and andragogic (adult learning) principles.



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The Scie-Bono Discovery Centre serves as a laboratory for career mentoring and STEM engagement.

As a facilitator and mentor at the Scie-Bono Discovery Centre, the goal is to prepare learners for participation in the 4th Industrial Revolution (4IR) by providing exposure to coding, robotics, nanotechnology, and career readiness skills.



Career & Study Skills

CV Writing, Time Management, Job Search Skills



4IR Technologies

Robotics, Coding (C++, Python), 3D Design, IoT Essentials



Nanotechnology Workshops

"Nanotechnology and Water,"
"Nanotechnology and Mining,"
"Nanotechnology and Energy."



Hands-on Experiments

Building graphite circuits to test resistance, designing posters on gas sensors for mines

Key Partners: Department of Education, Eskom, City Power

NotebookLM

Innovative assessment models and digital platforms are leveraged to ensure quality and learner success.

Moving beyond traditional testing, this approach uses modern assessment tools to provide a holistic view of competency. This includes structured rubrics, digital portfolios, and learner dashboards for real-time feedback, aligning with frameworks from bodies like the SQA (Scottish Qualifications Authority).

Criterion	Very Satisfactory (25)	Satisfactory (18.75)	Competent (12.5)	Deficient (0)
Problem Solving	Analyzes complex issues and develops innovative solutions.	Solves problems effectively with minor guidance.	Applies standard procedures to solve routine problems.	Fails to identify or solve problems.
Application of Theory	Seamlessly integrates theory into practical, novel applications.	Correctly applies theoretical concepts to given tasks.	Demonstrates basic understanding of theoretical application.	Unable to connect theory to practice.
Practical Implementation	Executes tasks flawlessly with high precision and efficiency.	Completes tasks to a good standard with minimal errors.	Completes tasks but may require correction or supervision.	Fails to complete practical tasks.

Digital tools like Learner Dashboards visualize progress, achievements, and areas for improvement, providing actionable insights to both learners and educators.



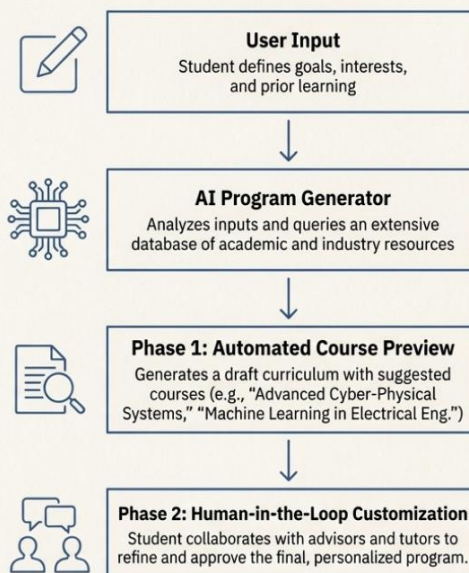
NotebookLM

The future of pedagogy is explored through the application of AI in personalized curriculum design.

Leveraging Generative AI to create bespoke academic programs that reflect a student's professional goals and personal vision. This approach, exemplified by the AIU AI Program Generator, represents the frontier of educational technology, emphasizing self-directed, industry-aligned learning.

Open Curriculum

Students are empowered to define their own courses, drawing from AIU's database, external resources, or entirely new proposals.



NotebookLM

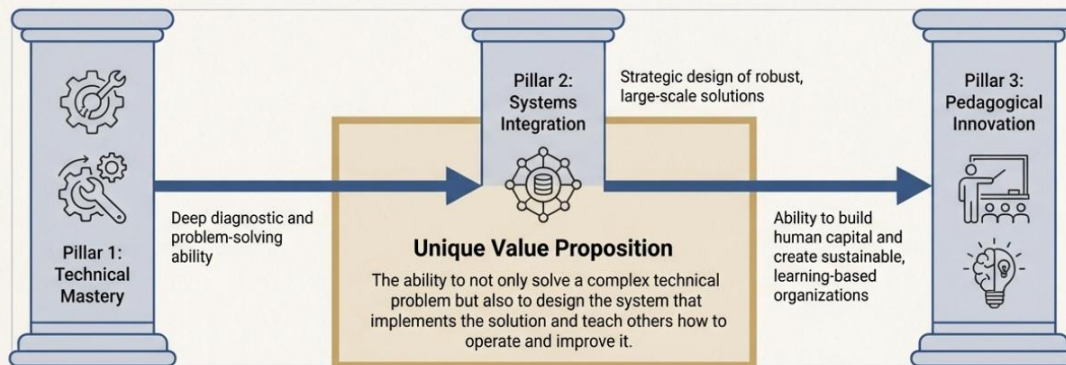
Navigating systemic challenges in qualification recognition has forged a resilient and advocacy-driven approach.

The journey to build this framework has included significant challenges in getting formal qualifications (N1-N6, Diplomas, Degrees) recognized by bodies such as SAQA and DHET. These protracted disputes, involving the CCMA and Labour Court (e.g., Case JR 2461/15), were not setbacks. They became a real-world curriculum in **systemic analysis, legal frameworks**, and the critical importance of **verifiable, competency-based evidence**.



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The three pillars converge to create a unique capability: a systems architect for complex socio-technical challenges



The framework is more than a collection of skills; it is an integrated process for analysis, design, and implementation. It combines the 'what is possible' of engineering, the 'how to achieve it' of systems management, and the 'how to scale it' of education.

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This expertise framework is a living model for solving future problems in smart infrastructure, sustainable energy, and lifelong education.

The challenges of tomorrow—from integrating renewable energy into smart grids to developing secure cyber-physical systems and fostering an adaptable workforce—require a multi-disciplinary approach. The Expertise Framework is designed not for the problems of the past, but as an adaptive tool for the opportunities of the future.



Smart Infrastructure

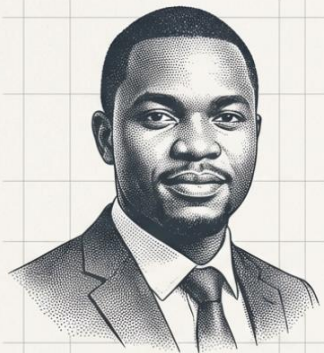


Sustainable Energy



Lifelong Education

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**Fiston Tshingombe
Tshitadi: Engineer.
Systems Architect.
Educator.**

A multi-disciplinary professional with proven expertise in:

- **Electrical & Electronics Engineering:** N1-N6, Power Systems, Industrial Automation, Digital Systems.
- **Systems Engineering & Management:** Public Infrastructure (Policing, Traffic), Industrial Controls, Financial Systems.
- **Education & Curriculum Development:** STEM Mentoring, AI-driven Pedagogy, Competency-based Assessment.

✉ tshingombefiston@gmail.com

🌐 t5h2i0tadi/tshingombe-engineerig-data-science-sarb-

📄 [View Verifiable Credentials](#)

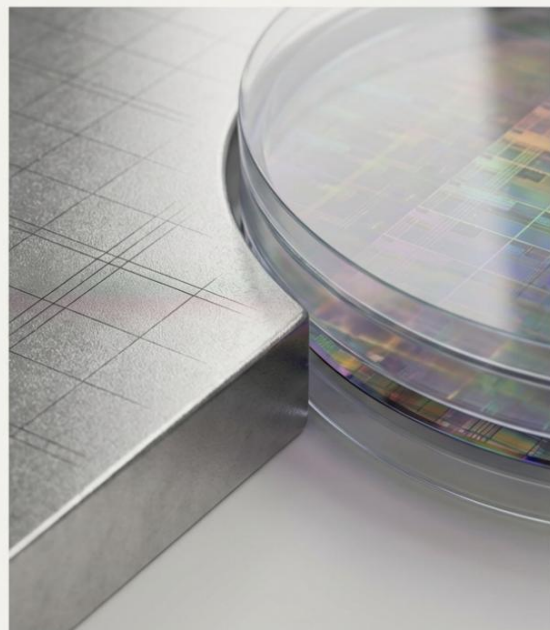
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ENGINEERING THE CONVERGENCE OF PHYSICAL INFRASTRUCTURE AND DIGITAL INTELLIGENCE

A Portfolio of Evidence for Solving Complex,
Interconnected Systems Challenges

The critical challenges of the 21st century exist at the intersection of atoms and bits. Securing our energy grids, optimizing manufacturing, and building sustainable infrastructure now demands a holistic understanding of electrical engineering, artificial intelligence, and cybersecurity.

This portfolio demonstrates a purpose-built expertise, meticulously developed to operate at this convergence.



Tshingombe Tshitadi Fiston

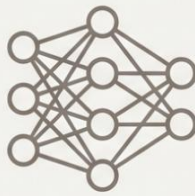
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A MULTI-PILLAR APPROACH TO SYSTEMS ENGINEERING

Mastery in the modern era requires deep, specialized knowledge across four integrated domains. Each pillar represents a foundational block of expertise, from the principles of power to the architecture of future technologies.



Pillar I: Power & Electrical Systems



Pillar II: Software, Data & AI



Pillar III: Cybersecurity & Resilient Systems



Pillar IV: Emerging & Frontier Technologies

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PILLAR I: FOUNDATIONAL MASTERY IN ELECTRICAL & POWER SYSTEMS

A comprehensive command of the physical layer, from generation and transmission to infrastructure and control. This expertise forms the bedrock for designing and managing modern energy systems.

Key Areas of Study

- **Doctorate-Level Focus:** Specialist Engineering in Infrastructure and Contractors: Electrical Engineering.
- **Power Systems:** Advanced Power System Analysis, Smart Grids & IoT Applications, High Voltage Engineering.
- **Renewable Energy:** Sustainable Electrical Engineering Practices, Solar/Wind Energy Systems, Clean Energy Technology.
- **Infrastructure:** Electrical Systems in Construction & Civil Engineering, Electrical Infrastructure Design & Management.
- **Control Theory:** Electrotechnical studies in AC/DC machines, motor control, and excitation.

Tangible Proof: Technical Calculations

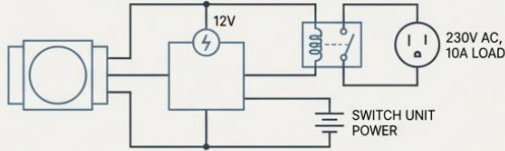
$$h_{plant} = \frac{ms(h4-h1)}{m_f \times h_v} \cdot \frac{\times 100}{1} = 83,25\%$$

$$V_{mean} \text{ at } 0^\circ = \sqrt{2/2\pi \times V_{RM} \times (1 + \cos \alpha)} \\ = 108,038v$$

NotebookLM

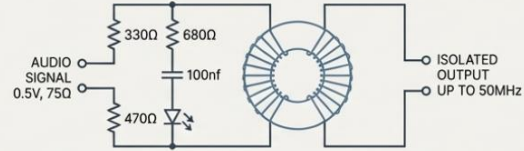
FROM THEORY TO TANGIBLE APPLICATION: A PORTFOLIO OF PRACTICAL PROJECTS

Knowledge is validated through application. This selection of projects demonstrates hands-on experience in circuit design, component selection, and system construction for real-world sensing and control applications.



PIR-Triggered Mains Switch

- **Objective:** Design a motion-activated switch for a 230V AC outlet with a 10A load limit.
- **Key Components:**
 - PIR detector with 20m range
 - Regulated 12V power circuit
 - UB2-size plastic box housing
 - 20A-rated relay contacts
 - Unregulated 17V DC power for virtual contacts
- **Function:** Senses movement to switch mains power, with battery operation for the switch unit itself.



Audio Converter Prototype & Lab Testing

- **Objective:** Design and build a circuit to convert and couple audio signals.
- **Key Components:**
 - Resistors: 330 ohm, 680 ohm, 470 ohm
 - Capacitor: 100nF
 - Semiconductors: Standard yellow LED
 - Coupling Transformer: Toroidal core for signals up to 50MHz
- **Function:** Provides galvanized isolation and impedance matching for audio signals (0.5V and 75ohm).

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PILLAR II: ARCHITECTING THE DIGITAL LAYER WITH SOFTWARE, DATA & AI

Building on the physical foundation, this pillar represents mastery over the software, data, and intelligence that drive modern systems. Expertise spans from software engineering fundamentals to the implementation of advanced AI solutions on cloud platforms.

Key Areas of Study

- **Software Engineering:** Principles of Software Engineering Basics, C# & Java Programming, Immutable Data Storage Solutions.
- **Data Management:** Database management (Oracle, SAP), SQL Server Migration & Optimization, Azure Cosmos DB fundamentals.
- **Artificial Intelligence & Machine Learning:** Building AI solutions with Azure OpenAI Service, training regression, classification, and deep learning models.
- **Cloud & Enterprise Platforms:** Salesforce Trailblazer development, Azure AI Search, Microsoft Copilot Studio.



Recent Certifications (Microsoft Learn)

- ✓ **AI Skills Challenge:** Build next generation apps with Azure OpenAI (47% completed)
- ✓ **Assess SQL Server databases for migration to Azure SQL** (Completed 11/20/2023)
- ✓ **Train and evaluate deep learning models** (Completed 11/9/2023)

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PILLAR III: SECURING THE SYSTEM WITH A CYBERSECURITY & RESILIENCE FRAMEWORK

As systems converge, their attack surfaces expand. This expertise focuses on designing resilient infrastructure by integrating security at every layer, from network protocols to data privacy and regulatory compliance.

Key Areas of Study & Engagement

- **Cyber-Physical Systems (CPS) Security:** Analysis of security and privacy vulnerabilities in integrated physical and computational systems.
- **Infrastructure Security:** Cybersecurity in Smart Infrastructure, Network Security Essentials for Digital Libraries, Access Control in Library Networks.
- **Data Integrity & Privacy:** Immutable Data Structures, Digital Rights Management, Data Privacy in Distributed Ledger Technology (DLT).
- **Governance, Risk & Compliance (GRC):** Engagement with ISC² (International Information Systems Security Certification Consortium), including a proposal for Security Congress 2025 on "Framework Qualification Education Technology".
- **Threat Detection:** Analysis of ICT security procedures, prevention/recovery strategies, and identification of potential risk areas.



20%

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PILLAR IV: ENGINEERING FOR THE NEXT FRONTIER WITH EMERGING TECHNOLOGIES

Solving tomorrow's problems requires an understanding of tomorrow's tools. This pillar represents a deep engagement with paradigm-shifting technologies poised to redefine systems engineering.

Quantum Computing & Advanced Systems

- * Quantum Computing in Systems Engineering:
 - * Introduction to Quantum Algorithms & Information Theory
 - * Quantum Gates, Circuits, and Programming Languages
 - * Analysis of Quantum Supremacy and its implications
- * Autonomous Systems:
 - * Advanced Studies in Autonomous Vehicles and Drones
 - * Machine Learning & AI for Autonomous Systems
 - * Sensor Technologies and Data Processing

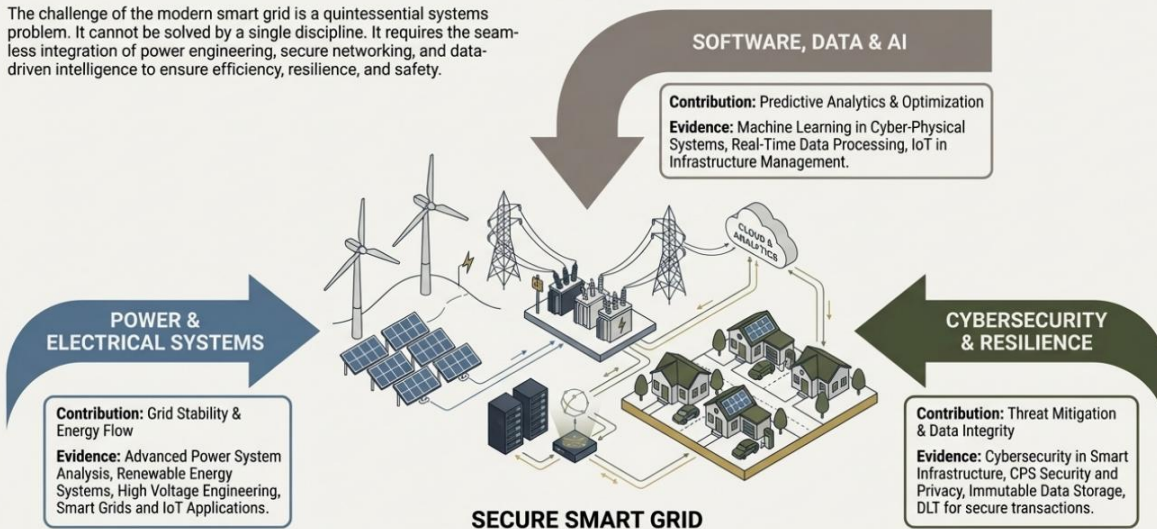
Biotechnology & Advanced Manufacturing

- * Synthetic Biology & Genetic Engineering:
 - * Fundamentals of DNA sequencing and CRISPR
 - * Applications in Urban Agriculture and Vertical Farming
 - * Biopharmaceutical and Advanced Manufacturing Techniques
- * Distributed Ledger Technology (DLT):
 - * Blockchain for Secure Credentialing
 - * Smart Contracts in Educational & Supply Chain Transactions

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SYNTHESIS: A UNIFIED APPROACH TO DESIGNING SECURE AND INTELLIGENT SMART GRIDS

The challenge of the modern smart grid is a quintessential systems problem. It cannot be solved by a single discipline. It requires the seamless integration of power engineering, secure networking, and data-driven intelligence to ensure efficiency, resilience, and safety.



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BEYOND THE TECHNOLOGY: INTEGRATING ENGINEERING WITH MANAGEMENT, POLICY, AND LAW

Effective implementation requires more than technical acumen. It demands an understanding of the supply chains, project management frameworks, and regulatory environments that govern industries.

Key Competencies



Industrial Engineering & Supply Chain

- * Masters in Supply Chain Management and Traceability
- * Wholesale Trade Management, Procurement Strategies, Inventory Control
- * Blockchain for Supply Chain Traceability, IoT and Smart Supply Chains



Project & Production Management

- * Project Management in Electrical Engineering
- * Supervision and Management in Industrial Operations
- * Computer Integrated Manufacturing (CIM), CAD, Bill of Materials



Legal & Regulatory Frameworks

- * Knowledge of SAQA, NQF, and DHET frameworks
- * Analysis of labor relations, industrial law, and apprenticeship contracts
- * Understanding of safety regulations and security procedures

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THE INTERDISCIPLINARY SYSTEMS ENGINEER: READY FOR THE CONVERGENT FUTURE

The evidence presented demonstrates a rare and deliberate combination of capabilities:

- Deep technical mastery in the foundational science of electrical and power engineering.
- Proven fluency in the modern languages of software, data, and artificial intelligence.
- A strategic mindset for securing complex systems and anticipating future technological shifts.
- Resilience and drive to apply this knowledge to the world's most critical infrastructure challenges.

This is not a collection of disparate skills, but a unified portfolio engineered to solve the problems of an interconnected world.



Tshingombe Tshitadi Fiston

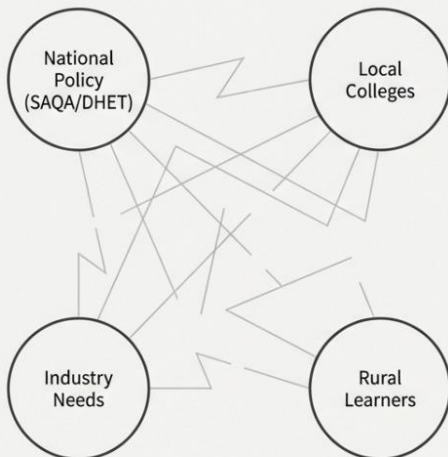
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An Integrated Framework for South Africa's Vocational Future

Bridging Policy, Industry, and Academia
in Engineering Education

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South Africa's Vocational Education System is Characterized by Systemic Fragmentation



A chasm exists between national frameworks and local college needs, undermining the quality and credibility of our vocational qualifications.

"Systemic gaps in the training, assessment, and qualification process, particularly in rural areas or places with economic instability."

"Policy discrepancies... hinder effective implementation at the college level."

"Backlog in qualification verification and certification issuance."

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A System Under Strain: Four Key Frictions



Policy-Practice Disconnect

National frameworks like the NQF are not agile enough to meet the specific needs of local institutions, leading to implementation challenges and qualification mismatches.



The Geographic Disparity

Rural institutions face critical limitations in resources, qualified teaching staff, and infrastructure, creating significant irregularities in access and educational outcomes compared to urban centers.



Industry-Academia Misalignment

A persistent gap between classroom learning and real-world application leaves graduates without the practical skills demanded by key sectors like energy and manufacturing.



Inconsistent Quality Assurance

A lack of standardized training for lecturers in assessment, coupled with infrastructure issues, leads to irregular examination schedules and compromises the credibility of qualifications.

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The Solution: A Unified Competency Framework for Engineering Trades

This framework integrates curriculum, industry practice, and technology to create a responsive, credible, and nationally coherent vocational education system.



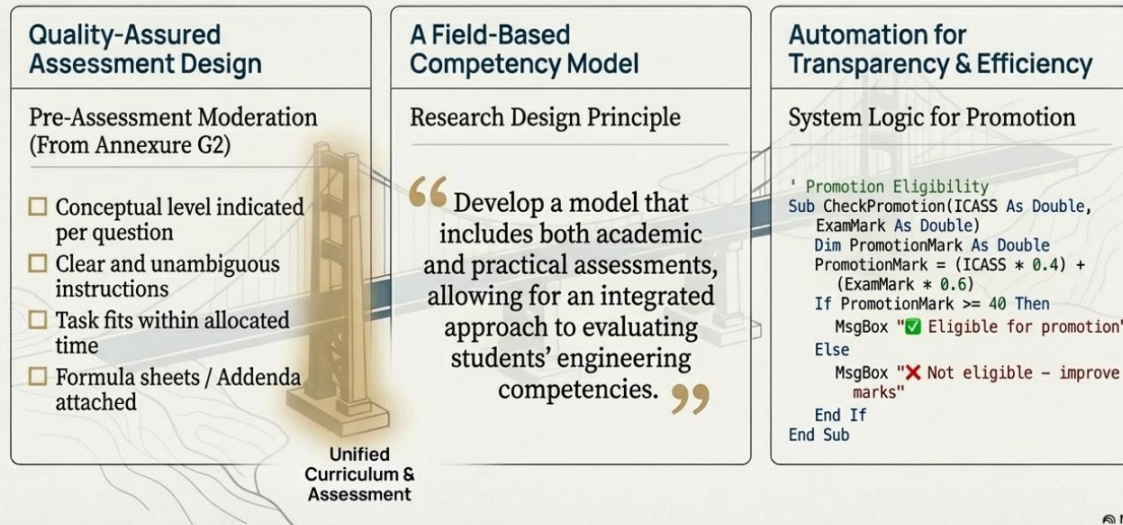
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Pillar 1: A Unified Curriculum Built on Rigorous Engineering Principles

Advanced Theoretical Core	Mathematical Foundations	Structured Learning Pathways										
From Electrotechnics N6 Syllabus - Line Frequency Phase Controlled Rectifiers - DC-DC Switch Mode Converters - Pulse-Width Modulation (PWM) - Three-phase systems and transformers	Core Power System Formulae $S = P + jQ$$S = \sqrt{P^2 + Q^2}$$\text{Power Factor: } \cos(\theta) = \frac{P}{ S }$$P = \sqrt{3} \times V_l \times I_l \times \cos(\theta)$	SAQA NQF Alignment <table><tr><th>Title</th><th>Details</th></tr><tr><td>Qualification</td><td>National Certificate: Electrical Engineering</td></tr><tr><td>Level & Credits</td><td>NQF Level 3, 133 Credits</td></tr><tr><td>Structure</td><td>Core, Fundamental, and Elective Components</td></tr><tr><td>Specializations</td><td>Mining, Renewable Energy, Electrical Construction</td></tr></table>	Title	Details	Qualification	National Certificate: Electrical Engineering	Level & Credits	NQF Level 3, 133 Credits	Structure	Core, Fundamental, and Elective Components	Specializations	Mining, Renewable Energy, Electrical Construction
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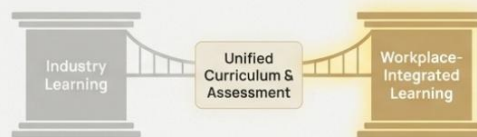
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Grounding Theory in Practice Through Modern Assessment



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Pillar 2: Forging the Industry-Academia Bridge Through Integrated Learning

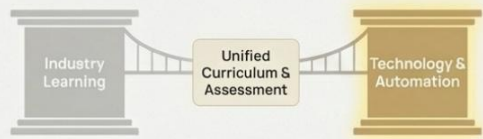


The framework moves beyond theoretical knowledge by embedding structured, real-world industry experience as a non-negotiable component of qualification.

Evidence Panel 1 Mandated Workplace Experience	Evidence Panel 2 Industry-Led Training Modules	Evidence Panel 3 Real-World Case Studies
Official regulation Requires proof of 24 months of workplace experience in a relevant engineering environment. A logbook with tasks, dates, and supervisor signatures must be submitted with the diploma application.	Schneider Electric - Industrial automation and Programmable Logic Controllers (PLCs) - PLC fundamentals and Modicon ranges - Troubleshooting skills for industrial systems	Real-world scenarios will be presented, such as city power systems (City Power), industrial control challenges (Eskom), and load shedding analysis.

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Pillar 3: Technology as the Systemic Enabler for Scale and Quality



Leveraging technology to automate administration, personalize learning, and bridge the resource gap for rural institutions.

Evidence Panel 1

Data-Driven Management Systems

- field name	data type	description
- product_id	text	number automatically assigned
- supplier_id	number	links to supplier table
- category_id	number	links to categories table
- unit_price	currency	
- units_stock	number	

Evidence Panel 2

Custom Automation Solutions

```
Type SubjectRecord
Level As String
SubjectCode As String
SubjectName As String
Mark As Integer
Passed As Boolean
End Type
```

Evidence Panel 3

Enhancing Learner Access & Outcomes

“Enhance learner outcomes by introducing technological solutions that allow for more interactive and personalized learning experiences, especially in rural areas.”

“Examine how virtual labs or mobile training units can supplement traditional vocational facilities.”

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From Concept to Code: Automating Diploma Eligibility and Validation

To address administrative backlogs and ensure transparent, rule-based qualification awards, a custom validation engine was developed. This system automates the verification of subject completion, N-level requirements, and irregularity resolution.

```
' DHET Electrical Engineering Diploma Validator
Sub CheckDiplomaEligibility()
Dim n4_passed, n5_passed, n6_passed As Integer
Dim total_passed As Integer
' ... [code to loop through learner subjects] ...

1 ' 1. Counts passed subjects at N4, N5, and N6 levels.
' ...

2 ' 2. Checks for minimum subjects per level.
If n4_passed < 4 Or n5_passed < 4 Or n6_passed < 4 Then
    EligibilityStatus = "Fail: Incomplete levels."
    Exit Sub
End If

3 ' 3. Verifies workplace experience logbook status.
If Learner.LogbookComplete = False Then
    EligibilityStatus = "Fail: Logbook pending."
    Exit Sub
End If

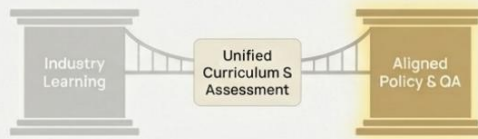
4 ' 4. Confirms all irregularities are resolved.
If Learner.IrregularityResolved = False Then
    EligibilityStatus = "Fail: Irregularity outstanding."
    Exit Sub
End If

EligibilityStatus = "Pass: Eligible for Diploma."
End Sub
```

```
graph TD
    1[1. Fetch Learner Record] --> 2[2. Count N4-N6 Subjects]
    2 --> D1{Minimums Met?}
    D1 -- No --> D1D[Deny Eligibility]
    D1 -- Yes --> 3[3. Verify Logbook]
    3 --> D2{Complete?}
    D2 -- No --> D2D[Deny Eligibility]
    D2 -- Yes --> 4[4. Check Irregularities]
    4 --> D3{Resolved?}
    D3 -- No --> D3D[Deny Eligibility]
    D3 -- Yes --> G[Grant Eligibility]
```

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Pillar 4: Aligning Policy for National Impact and Credibility



The framework provides a blueprint for resolving policy disagreements and aligning national standards (DHET, SAQA) with the practical realities of college-level implementation.

Evidence Panel 1 Core Research Question	Evidence Panel 2 Key Stakeholders & Frameworks	Evidence Panel 3 Compliance and Recognition
“How do policy discrepancies between national education frameworks (DHET, SAQA, etc.) and local college practices affect the quality and credibility of vocational qualifications?”		The framework addresses challenges in foreign qualification assessment and ensures compliance with SAQA's March 2017 Policy Implementation, which sets requirements for recognizing qualifications from government-recognized institutions.

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A Framework That Fosters Innovation and Protects Intellectual Property

A modern educational system must not only transfer knowledge but also equip learners and institutions to create and protect novel solutions. The framework integrates principles of intellectual property to prepare for an innovation-driven economy.

What is a Patentable Invention?

Any novel and useful creation, process, machine, or composition. Scientific principles and business methods are not patentable.

Software

Software is protected by copyright, but can be patented if it solves a technical problem.

The Three Criteria for Patentability



1. Novelty

Must not be publicly disclosed before filing.



2. Utility

Must function and serve a useful purpose.



3. Inventive Step

Must not be obvious to a skilled professional.

NotebookLA

The Implementation Roadmap: A Phased Approach to Systemic Change



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Envisioned Outcomes: A Dynamic and Responsive National System



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Appendix: A Cross-Section of Integrated Technical Competencies

Core Electrical Engineering

- Power Systems & Solar Integration
- AC/DC Machine Analysis
- Transformer Sizing & Fault Analysis
- Circuit Protection (SANS 10142)
- PLC Programming

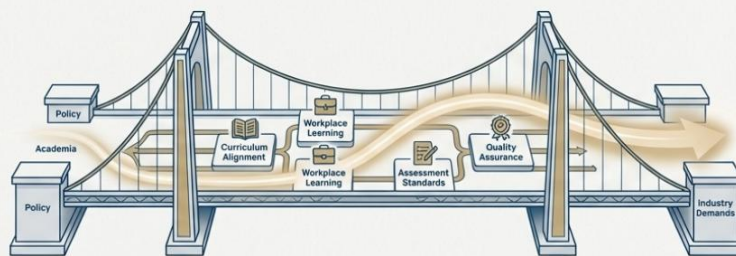
Digital & IT Integration

- Database Management (SQL)
- Visual Basic Automation
- Google Cloud & ICT Platforms
- Online Learning Management Systems (LMS)
- IoT & Sensor Integration

Workplace & Professional Skills

- ISO Compliance in Projects
- IP Licensing & Patent Criteria
- Project Management & Costing
- Technical Report Writing Writing
- SAQA/DHET Policy Navigation

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Building a Coherent Future, Together

The evidence is comprehensive. The model is robust.
 The need is urgent. This framework is more than a proposal; it
 is an engineered blueprint for a vocational education system that
 is equitable, efficient, and aligned with the future of South Africa.
It is time to build.

NotebookLM

From Theory to Impact: The Professional Profile of Fiston Tshingombe Tshitadi

An Engineering Innovator Bridging Academics, Application, and Entrepreneurship

Academics

Application

Entrepreneurship



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A Synthesis of Engineering Excellence

This portfolio presents Fiston Tshingombe Tshitadi as a dynamic engineering professional defined by four key pillars: a rigorous academic foundation, deep hands-on technical application, proven entrepreneurial acumen, and a forward-looking vision for systemic industry improvement. Each pillar demonstrates a commitment to bridging the gap between theoretical knowledge and tangible impact.



1. Academic Foundations

Comprehensive NATED and SAQA qualifications in Electrical Engineering.



2. Technical Application

Mastery of core engineering principles and practical skills in diagnostics, design, and implementation.



3. Entrepreneurial Venture

Successful translation of engineering skills into commercial value and business development.



4. Visionary Research

A structured plan to solve the critical disconnect between engineering education and industry demands in South Africa.

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Pillar I: A Rigorous Academic and Aptitude Foundation

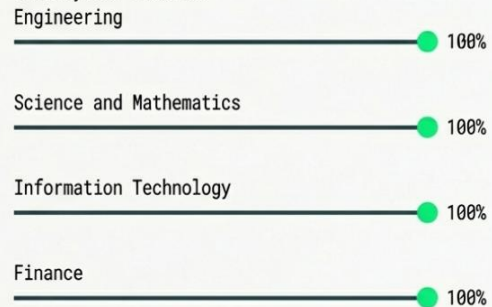
Formal Qualifications

- **National NATED Diplomas (N1-N6) in Electrical Engineering:** A comprehensive vocational education covering foundational to advanced concepts.
- **SAQA Registered Qualifications:** Including National Certificates in Electrical Engineering (e.g., SAQA ID: 67375, 66960).
- **Core Subjects Studied:**
 - Mathematics (N1-N4)
 - Engineering Science (N1-N4)
 - Industrial Electronics (N1-N4)
 - Electrical Trade Theory
 - Electrotechnics & Electrotechnology
 - Power Machines
 - Engineering Drawing

Career Aptitude Assessment

Validated Aptitude for Technical and Scientific Fields.

GoStudy.net results:



Pillar II: Mastery of Core Engineering Principles

A profound understanding of the mathematical and physical laws governing electrical systems is the bedrock of effective engineering. This selection of applied formulae demonstrates mastery across key domains.

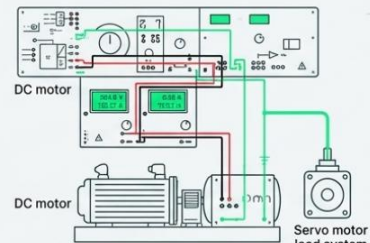
 Circuit Theory	 AC/DC Machines	 Transformers	 Electromagnetism	 Calculus & Advanced Mathematics
Kirchhoff's Laws: $E_T = I_1 \cdot R_1 + (I_1 - I_2) R_3$ Thévenin/Norton Equivalents	Synchronous Motor Equations: $V = E_b + I_a(R_a + jX_s)$ DC Motor Equations: $N = \frac{v - I_a R_a}{k \cdot \phi}$	Voltage Regulation: $\% \text{ reg} = \frac{V(\text{no-load}) - V(\text{full load})}{V(\text{no-load})} \times 100\%$ Turns Ratio: $\frac{N_1}{N_2} = \frac{V_1}{V_2}$ Three-Phase Connections (Star-Delta)	Biot-Savart Law: $d\vec{B} = \frac{\mu_0 \cdot I \, d\vec{s} \times \hat{r}}{4\pi r^2}$ Faraday's Law: $E = -\frac{\Delta\Phi}{\Delta t}$	Differential Equations: $\frac{dy}{dx} + P(x)y = Q(x)$ Integration for Volume: $V = \int \pi[y(x)]^2 dx$ Limits: $\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n = e$

NotebookLM

From the Lab to the Field: Applied Technical Expertise

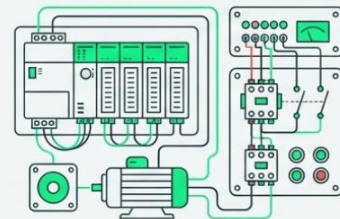
Practical Skills & Diagnostics

- **Motor Rewinding:** Detailed process knowledge, including stator analysis (e.g., 'number of stator gaps $z=24$ ', 'width of slot $b_1=6,621\text{mm}$ ').
- **Fault Finding & Protection:** Expertise in control circuits, protective devices, fault discrimination, and compliance with installation rules (PVC, flexible conduit).
- **Installation & Compliance:** Deep familiarity with SABS/SANS standards (e.g., SANS 10142) for electrical installations, including distribution boards, circuit breakers, and earth leakage protection.



Laboratory & Didactic Experience

- **Hands-on Training:** Experience with advanced didactic training systems for electrotechnology, PLC, and motor control.
- **Key Experiments:**
 - Determination of Efficiency and Voltage Regulation of a single-phase Transformer by direct loading.
 - DC Shunt-Wound Motor 'Load characteristic' setup.
 - Power electronics labs using modular Lab-Volt and DSPACE equipment.



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